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IN THE MATTER OF:

Advisory Committee on Reactor Safeguards

334th General Meeting

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PUBLIC NOTICE BY THE
UNITED STATES NUCLEAR REGULATORY COMMISSION'S
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

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UNITED STATES NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD PANEL

In the Matter of:)

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334th GENERAL MEETING)

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Friday,
February 12, 1988

Room 1046
1717 H Street, N. W.
Washington, D. C. 20555

The above-entitled matter came on for hearing, pursuant to notice, at 8:30 a.m.

BEFORE: DR. WILLIAM KERR
Chairman
Professor of Nuclear Engineering
Director, Office of Energy Research
University of Michigan
Ann Arbor, Michigan

ACRS MEMBERS PRESENT:

DR. FORREST J. REMICK
Vice-Chairman
Associate Vice-President for Research
Professor of Nuclear Engineering
The Pennsylvania State University
University Park, Pennsylvania

MR. JESSE C. EBERSOLE
Retired Head Nuclear Engineer
Division of Engineering Design
Tenessee Valley Authority
Knoxville, Tennessee

ACRS MEMBERS PRESENT (CONTINUED):

DR. HAROLD W. LEWIS
Professor of Physics
Department of Physics
University of California
Santa Barbara, California

MR. CARLYLE MICHELSON
Retired Principal Nuclear Engineer
Tennessee Valley Authority
Knoxville, Tennessee, and
Retired Director, Office for Analysis and Evaluation of Operational Data
U. S. Nuclear Regulatory Commission
Washington, D. C.

DR. DADE W. MOELLER
Professor of Engineering in Environmental Health
Associate Dean for Continuing Education
School of Public Health
Harvard University
Boston, Massachusetts

DR. PAUL G. SHEWMON
Professor, Metallurgical Engineering Department
Ohio State University
Columbus, Ohio

DR. CHESTER P. SIESS
Professor Emeritus of Civil Engineering
University of Illinois
Urbana, Illinois

DR. MARTIN J. STEINDLER
Director, Chemical Technology Division
Argonne National Laboratory
Argonne, Illinois

MR. DAVID A. WARD
Research Manager on Special Assignment
E. I. du Pont de Nemours & Company
Savannah River Laboratory
Aiken, South Carolina

ACRS MEMBERS PRESENT (CONTINUED):

MR. CHARLES J. WYLIE
Retired Chief Engineer
Electrical Division
Duke Power Company
Charlotte, North Carolina

ACRS COGNIZANT STAFF MEMBER:

Raymond Fraley, Executive Director

Thomas G. McCreless, Assistant Executive Director

NRC STAFF PRESENTERS:

Steven D. Richardson

Eileen McKenna

P R O C E E D I N G S

CHAIRMAN KERR: The meeting will come to order. This is the 334th meeting of the Advisory Committee on Reactor Safeguards. Today the committee will discuss TVA Nuclear Power Plant operations, NRC safety bill, reports on valve performance, radiography, nuclear waste management, future activities, NRC process for resolving generic issues, selection of ACRS members and ACRS practices and procedures.

This meeting has been conducted in accordance with provisions of the Federal Advisory Committee Act of the Government in the Sunshine Act. Mr. Raymond Fraley is the designated federal official for this part of the meeting. We have received no written statements or requests to make oral statements.

The transcript of the meeting is being kept. I ask that each speaker identify himself or herself and use the microphone. The first item on today's agenda is the TVA Nuclear Power Plant management operations by Mr. Charles Wylie, the appropriate subcommittee chairman.

MR. WYLIE: Thank you Mr. Chairman. This part of our meeting has been mentioned, concerns the committees continued review of the TVA organizational issues. The material is in your books under tab 6 and a number of handouts numbered four, seven, nine and I believe Dick just handed out this ANI thing.

The subcommittee on TVA organizational issues met on February 2 of this year in Chattanooga and held discussions with both the NRC staff and TVA and visited the Sequoyah site on February 3 and inspected selected areas of the plant.

The members in attendance were myself, Jesse Ebersole, Carlyle Michelson, Dave Ward, Dick Savio, cognizant ACRS staff members and management consultants Paul Bartlick and Homer Hagedorn.

The object of the subcommittee meeting was to obtain a better understanding of the TVA management reorganization activities and how well the measures which had been taken had been implemented and reviewed by the staff and to explore other areas of concern which had been raised particularly by the NRC staff's integrated design inspection of the essential raw cooling water system.

In regard to the staff's inspection of the essential raw water cooling water system, the staff had identified a number of seemingly programatic weaknesses which may have had generic implications in other systems of the plant. The subcommittee wanted to review those areas.

The subcommittee had the benefit of the staff safety evaluation report on the Sequoyah Nuclear Power Plant and other related documents prior to the subcommittee meeting. At the meeting the subcommittee heard presentations by the staff on the staff's schedule of TVA reviews; management reviews and activities; the assessment of the Sequoyah status mechanism for review of evaluating management; the discussions of the staff's integrated staff inspection of the emergency raw water system; and lessons learned from that inspection and staff's conclusions regarding the effectiveness of TVA's recovery activities.

TVA made presentations on their response and measures taken as a result of the findings of the IDI inspection. Design control, design verification and review, operational readiness, employee concerns, environmental qualification issues and more detail about the Nuclear Safety Review Board and how nuclear experience feedback is implemented.

During the visit to Sequoyah, the subcommittee met with the plant staff and discussed plant organizational issues and then toured selected areas of the plant including the control room, the separate shut down panel, the cable spreading room, switch gear rooms, compressed air systems and looked at the fire protection facilities and provisions, the diesel generator building and the emergency raw water system.

One item of interest to the committee was the addition on the Sequoyah staff of two positions of assistant plant managers which insure that a senior plant manager is on duty 24 hours a day at the Sequoyah plant.

Today we have selected several items of interest that we felt that the full committee should hear and presentations by the staff and TVA will be made. Before we proceed, I would ask other members of the subcommittee if they would like the to make comments.

(No response.)

Well let's proceed then and I will call on Steve Richardson of the staff.

MR. MOELLER: Charlie, while we are going on in the review of Sequoyah are we going to here anything about the control room HVAC system. In the writeups that were provided to us, they said they may need to increase the ventilation inflow above the unit to meet the requirements.

MR. WYLIE: We had not asked that specifically but we can ask Mr. fox if they can address that.

MR. MOELLER: Also the hydrogen analyzers. There were questions on those.

MR. WYLIE: Yes, we can answer those questions.

MR. RICHARDSON: I'm Steve Richardson the Division Director of the TVA Division in the Office of Special Projects. With us this morning from the NRC staff Jane Axelrad who is the Deputy Director of the Office of Special Projects. Jim Clifford, Special Assistant to the Division Director. Angelo Moreno, who is the Assistance Branch Chief.

Eileen McKenna, the Senior Project Manager. Bob Pearson, the Branch Chief of the Plant Systems Branch. And BD Leo, who is the Assistant Director for Technical Programs. In terms of recovery schedule, Sequoyah Unit 2 is currently in mode 4.

(Slide.)

Reactor coolant system temperature is about 250 degrees, pressure at about 475 psg. The Office of Special Projects director gave TVA approval to move from mode 5 to mode 4 on February 4th. They actually made the transition late in the afternoon on February 6th. They are currently in the the process of running through a number of surveillance instructions, checking out plant systems and beginning the heatup cycle. Their planned heatup is going to last on the the order of 30 to 35 days depending on the types of problems they run into.

The NRC has an augmented site coverage team on site with an inspector in the control room most of the time, not 24 hours a day but a lot of the time. We have several shifts of augmented inspection personnel from region helping us to cover the various surveillance instructions underway.

We have a senior manager that is assigned. That is currently Gary Zack who is covering the site on a full time basis. The schedule for Sequoyah Unit 2 is approximately six months after the restart-- I'm sorry. The schedule for Unit 2 is, criticality on it looks like the first week in March. Unit 1 will be following Unit 2 approximately 6 months later.

TVA is in the process, as resources become available from the various tasks in Unit 2, of shifting them over to Unit 1.

MR. MOELLER: Excuse me. I'm sure that question has been asked many times, the difference in timing is one of resources, not differences in the two units?

MR. RICHARDSON: That is correct.

At the Browns Ferry site Unit 2 is their lead unit to be restarted. They are currently projecting the fall of 1988. The NRC staff is beginning to shift our resources for Sequoya to Browns Ferry to support that.

Watts Bar is further down, 1990 to 1991. The staff last summer approved construction permit extensions to move that out.

Bellefonte, there is no specific date. The plant essentially is at a high state of completion but it is in lay up and 1993, 1994 is the projected date for that.

Any other questions on the schedule?

DR. REMICK: What is the function of the NRC inspector in the control room?

MR. RICHARDSON: We want to monitor the TVA operations, particularly shift changeovers, adherence to procedures, formalization of control room operations to make sure that we feel that when they think they are ready to go into mode 2 criticality, we agree with that decision.

DR. REMICK: Is that person an experienced reactor operations person?

MR. RICHARDSON: Yes, sir, he normally is one of the resident inspectors and quite frequently the senior resident inspector at that site.

CHAIRMAN KERR: Has he had experience in operations?

MR. RICHARDSON: No sir, he has not been a licensed individual. He goes through the normal training program that we put resident inspectors through to qualify.

CHAIRMAN KERR: He had not had experience, for example as a power plant operator?

MR. RICHARDSON: Not in the commercial business. The particular people at Sequoyah are former Navy nuclear personnel.

CHAIRMAN KERR: Thank you.

MR. RICHARDSON: Any other questions on schedule?

(No response.)

(Slide.)

I will briefly mention several items since the last time we met ACRS. The report was issued on November 6th. Since then, we have had a follow-up inspection that was completed last week and that report is in preparation.

Mr. Wylie mentioned our safety evaluation report on Sequoyah restart. We issued that on January 21st. That covered 39 of the 46 programatic issues in the TVA, Sequoyah performance plan. We are about ready to issue a supplement to that SER that will pick up all of the remaining items.

The two items still outstanding are the civil calculation area and electrical calculations and we are working on those. We have an inspection going on next week to close those items out.

The Office of Special Projects briefed the commission on January 20th on the status of the various items still underway at Sequoyah. We have another commission briefing scheduled before the commission vote on restart. The current scheduled date of that is February 24th. There is some discussion that that may slip, based on TVA actually not being ready to go critical until sometime early in March.

We are working on resolution of the employee concerns. The concerns that were applicable to Sequoyah were grouped into what is called element reports. There were 246 different element reports that were applicable that had to be done before restart. The staff has finished all but four or five of those and those four or five will be finished up in the next several days.

We have a large number of allegations. There were approximately 170 allegations at Sequoyah. At this moment we are about halfway through with that and that is proceeding at a fairly rapid pace so I don't see that as an issue in affecting the restart schedule.

We have had major inspections on the emergency operating procedures, operational readiness. We have gone with the training programs. During the system alignment phase that TVA was in for four or five weeks, we have had very intense coverage of that from both the site inspectors and the region to make sure that that process went well.

Are there any questions along this line?

CHAIRMAN KERR: Perhaps you are going to get to it but how do you deal with, if you do, comments for the American Nuclear Insurers?

MR. RICHARDSON: The American Nuclear Insurers did an inspection at Sequoyah in December to review operations at the site for the purpose of determining risk liability. Their report was very critical of a number of things, particularly the Plant Operations Review Committee. We forwarded that report to TVA and asked them to respond to each of the findings as part of their operational readiness assessment which we are yet to review.

We are going to have a public meeting with TVA to go over why they think they are ready for operations and each of the American Nuclear Insurers findings will be gone over at that point.

MR. SIESS: You said you forwarded that report to TVA? Do you mean that TVA would not have gotten that report?

MR RICHARDSON: No, sir. TVA had the report. We got the report from TVA but we, formerly on the docket, in a letter to Mr. White asking for a response on an item by item basis to each of the responses.

MR. MICHELSON: In the past have you audited the operations of the PORC Committee?

MR. RICHARDSON: Yes, we sat in on various PORC's and also the integration of the PORC Committee with the NSRB.

MR. MICHELSON: What was your observation concerning these meetings?

MR. RICHARDSON: Our observations were back during the summer. We were generally satisfied with how they went together. We noted that improvements could be made.

MR. MICHELSON: So, you didn't necessarily exercise the same degree of critical observation that the insurers exercised apparently.

MR. RICHARDSON: I think that is correct.

MR. MICHELSON: Have you ever sat in on the operations of the Nuclear Safety Review Board?

MR. RICHARDSON: I personally haven't.

MR. MICHELSON: I mean as an agency.

MR. RICHARDSON: The agency has sat in on various NSRB meetings and we get all the minutes.

MR. MICHELSON: And what have been their observations concerning those meetings.

MR. RICHARDSON: We think that they are operated successfully.

MR. MICHELSON: Thank you.

MR. EBERSOLE: What is your yardstick of successful. For instance, one viewpoint you could take is it is not in compliance with existing regulations and another you could take is that there are no regulations which are pertinent to it but it is still a safety matter. Where do you view the line there? Do you require or suggest or permit extensions of rationale and logic beyond the simple regulations and rigid adherence to at least a minimum standard of those?

MR. RICHARDSON: Our focus is on the safety issue.

MR. EBERSOLE: Yes, but what is the safety issue? Is it noncompliance with the regulation?

MR. RICHARDSON: Not necessarily. The safety issue is the hardware issues or operational issues at the plant and the risk to the public health and safety.

MR. EBERSOLE: It may have nothing to do with a particular regulation?

MR. RICHARDSON: I'm not sure I would say it would have nothing to do with it.

MR. EBERSOLE: Well, it might have a very distant interpretative relationship but that would be valid as far as the staff is concerned.

MR. RICHARDSON: That is true. That is right. In other words we do not insure simply compliance with the regulations. We go beyond that, if the safety conscience is there with the NSRB which is the purpose.

MR. EBERSOLE: Fine, that is what I wanted to hear.

MR. RICHARDSON: Any other questions?

(No response.)

Charlie, I didn't have anything else.

MR. WYLIE: Okay. Does the staff have anything else?

MR. RICHARDSON: Not in the overview.

MR. WYLIE: Any other questions?

MR. SIESS: Could you comment on any similarities or differences in the objective and scope of the ANI review of the plant and the NRC review of the plant? Are they interested in the same things you are, the health and safety of the public?

MR. RICHAR. ON: We haven't covered the ANI report in sufficient depth yet to insure that. My impression is that they are coming not from a pure safety perspective that the NRC is but more from a financial risk perspective and insurance liability.

DR. SIESS: Is this the first time you have seen an ANI report?

MR. RICHARDSON: This is the first time we have seen an ANI report at TVA.

DR. SIESS: Is this the only plant that ANI has ever inspected?

MR. RICHARDSON: No, ANI is going to all the plants. This is the first time that I'm aware that the NRC has gotten a specific report. I really don't have any other information on other plants at that point.

DR. SIESS: Thank you.

MR. EBERSOLE: A couple of things here. I have here and I think everybody has a copy of a letter to the commissioner dated February 3rd.

DR. REMICK: Mr. Ebersole, would you be willing to move that mike so that we can hear you better:

MR. EBERSOLE: It is a letter from a law firm but it refers to a gentlemen named Bartlick.

MR. RICHARDSON: Yes, sir. I'm familiar with the letter.

MR. EBERSOLE: What is the current disposition of that matter?

MR. RICHARDSON: We have met with Mr. Bartlick on several occasions and we have had lengthy interviews.

We are in the process of studying each of the issues he raises. He comes across as a very knowledgeable, very credible individual and we are going through his concerns in detail to insure that they are satisfactorily resolved.

MR. EBERSOLE: But that is still on going?

MR. RICHARDSON: Yes, sir, that is.

MR. EBERSOLE: But you don't regard that as an impediment to start up?

MR. RICHARDSON: These issues raised, we want to make sure they are resolved prior to operation of mode two. We have gone through his issues and insured and discussed with him whether any of these are impediments to mode 4 or mode 3 operation.

MR. EBERSOLE: There is another gentlemen from Congress very interested in this plan. As you know, Mr. Myers has also a comparable packet of papers and issues. What is the status of his allegations from that side?

MR. RICHARDSON: We have taken all of Dr. Myers' questions and we are insuring that the issues that he raised are addressed in our revise study at some point. We are not providing specific answers back to Dr. Myers but we are making sure the issues have been covered.

MR. EBERSOLE: Will there be some sort of a documented resolution of these sort of things? Will it be put in some sort of a package?

MR. RICHARDSON: There will be documentation of the allegations. For example I believe that the issues raised by Dr. Myers, we have attempted to prepare a matrix and we are in the process of doing that.

MR. EBERSOLE: It is so complex, I can understand why you should.

MR. RICHARDSON: It takes a lot of time but I believe it is a useful tool for us to go through to make sure nothing has fallen through the cracks.

MR. EBERSOLE: So these are still ongoing?

MR. RICHARDSON: Yes, sir.

MR. EBERSOLE: Thank you.

MR. WYLIE: Any other questions?

MR. WARD: Is the staff going to cover the rest of these topics, do you know?

MR. WYLIE: You mean these agenda items?

MR. RICHARDSON: We have separate briefings on the IDI and management reviews.

MR. WYLIE: Okay. I guess Charlie Fox of TVA will be next.

MR. FOX: I'm Charles Fox, Deputy Manager of Nuclear Power for TVA. I'd like to start out as Mr. Richardson did by introducing my people. I would ask that they stand. I have Bill Walley, Chief of the Electrical Branch. Jim Hutson, Assistant Electrical Branch Chief. John Hausner, Branch Engineer at Sequoyah.

We have John Cox an APE at Sequoyah. Joe Ziegler, Nuclear Safety and Licensing. Linda Tinker, Ken Hendricks, Nuclear Safety and Licensing. Barry Kinsey of Licensing, Mike Sidlacey, Electrical, Sequoyah. Fisher Campbell, Nuclear Safety and Licensing. Tony Caposey, our Head Manager of Engineering Assurance. carl Seidler, Assistant Chief of the Electrical Branch. Richard McMahon, DNE Safety and Licensing. Ruben Hernandez, our Assistant Branch Chief.

Fred Moreno, new manager of all of our disciplines who recently joined us from Gilbert Commonwealth. Tom Epileto who is our consultant and helps run our Bethesda office. Mr. McRae, Deputy Director of Safety and Licensing. Chris Eckle from our Washington office, Doug Wilson, Chief of Nuclear Technology. Joe Bynum, Assistant Manager for Operations and John Kirkebo, our Chief Engineer.

We are pleased to be before the full committee today. As Steve said, we introduced a number of topics to the subcommittee in Chattanooga on February 2nd. We are prepared to cover the items on your agenda and we are also prepared to answer the questions that the subcommittee has furnished us.

We are prepared to deal with the ANI issue with you today. We have had a subsequent reinspection by ANI. We got their letter yesterday. There is a marked improvement from the previous inspection. We still have a ways to go. So we will start on into the agenda.

Our first speaker will be Joe Bynum, our Assistant Manager for Operations. Your agenda shows Steve Smith. Steve is with his plan, mode 4 and Joe Bynum, Assistant Manager for Operations who recently joined us from Palo Verde where he was plant manager for all units there will be the first speaker.

MR. BYNUM: As Charlie indicated, I'm going to discuss the operational readiness restart and in particular focus on the operational readiness review team that Admiral White commissioned and put in place in August of 1987.

(Slide.)

Admiral White put an operational readiness review team in place in August of '87.

(Slide.)

In that he chartered several senior individuals, very experienced individuals with experience in not only commercial but military Naval reactors. A very simple task to assess the restart readiness relative to resources and personnel performance, to observe the activities and personnel during heatup.

The activities we focused on were operational activities. This obviously included the control room and the conduct of operationin the control room and also included all other aspects that related directly to the operation of the facility and the support of the operators in the control room, covered maintenance and covered RAD control, covered chemistry and other areas.

The period of assessment was from August 1987 through January of 88. An interim report was issued in October of '87. That is when Admiral White asked me to come on board and take the report and work with the operating organizations in assessing the report and responding to the findings.

In addition to the operational readiness review team that Admiral White put in place, we also suggested that INPO come in. That is one of the areas we wanted to look at not only with performance of the operators and the administrative controls and the support but we also wanted to look at the technical adequacy of the operators. So INPO came in and did an assist visit on the simulator.

In fact, did an audit of all of our operating crews. They came in two different periods and evaluated all the operating crews in the control rooms. As I said, the interim report was issued in October and we immediately began assessing the report and working on our corrective actions.

MR. MOELLER: No final report has been issued?

MR. BYNUM: Yes, the final report has been issued. The final report was issued in January and what we did, we sat down. We also included the two INPO assist reports. So we took the final ORR report, we took the two INPO assist visits and put them into one package. We looked at that.

INPO had made a couple of recommendations based on some specific areas of weaknesses that they felt like that the operating crews had in general. I will say that overall, the cover letter states that they found the performance of our operators above average on the simulator. They did find some specific areas and they made recommendations that those areas be looked at prior to restart.

So, we took those issues. I sat down with Frank Fogerty, who is the head of the ORR team, and we picked out certain issues that we called restart issues in the ORR report and put the two together and we began working on the corrective action responses. Last week we did complete and issue all of the responses to the restart issues. And hopefully by the end of February, at least by the middle of March, we will have responded to all of the ORR findings.

The report is out and a response has been made to all restart issues including the restart issues from INPO.

DR. REMICK: Would you give us a couple of examples of what INPO pointed out?

MR. BYNUM: Yes, we are going to get into that in a little bit more detail.

(Slide.)

Basic areas of concern were in three major areas and this is from the ORR report, management involvement, standards of performance and administrative controls.

Basically, in the management involvement area, the major concern was that management was not really effective in identifying problems and correcting those problems, getting the corrective action implemented and really down to the lowest level of the organization. Standards of performance, they saw indications based on lack of formailty and indications of things that our standards of performance were not as they would like them to be.

One thing I will point out, one of the reasons this group was picked, of course is for their experience and their background but also the very high standards that these individuals have. It was a very critical look. They did a lot of on-shift observations. They did detailed interviews with various employees. And again it was very high standards.

The other area of concern in the administrative controls procedures system had become very cumbersome. Some of our procedures were outdated. There were overlapping procedures. In some cases where there was overlap, there was actually inconsistency. And because of that, we had really developed a tendency to find work-arounds for our procedural problems. So that was an area of concern.

DR. REMICK: Could you give me a couple of examples when you say "standards of performance". I imagine all kinds of things.

Was this down to specific tasks, the standards of performance of that task or general?

MR. BYNUM: It was both. Actually what the ORR team did was they looked at a lot of specific activities and they had comments on those specific activities and then they looked globally at the types of comments they had and then we lumped them into, basically, management standards and formal communication. The formal communication repeat back was not universally used in the control room night orders.

The use of night orders in lieu of procedures or in some cases to supersede a part of the procedure. Those types of things which were just not the standard that we need to be operating under.

DR. REMICK: Thank you. Us.

DR. MOELLER: Excuse me. You use the term night orders. Could you elaborate?

MR. BYNUM: The night order is the shift supervisor, not the shift supervisor but the operations group manager, operations superintendent might issue a night order giving instructions through the night on the back shifts to have a certain evolution performed. And in some cases the ORR team found that this would be in contradiction to an existing procedure.

MR. EBERSOLE: There was a time when controller procedures were ritualistic much in the context if system B files turn on system A and it will always work. Is it true now that I could ask an operator down there what he would do if component cooling or ERCW or some such critical supply system failed in totality? Could he tell me when the first critical result of that would occur and what he would be doing to try to intercept it?

MR. BYNUM: Well, let me be sure I understand your question. You are talking about from a procedural point of view?

MR. EBERSOLE: Yes a procedural point of view in a badly degraded state.

MR. BYNUM: For the most part, I think the answer to your question is yes because we have a very detailed system of abnormal operating instructions?

MR. EBERSOLE: Yes, depending upon the degree of abnormality. That is what I'm searching for.

MR. BYNUM: Those procedures are very detailed and there are varying degrees of problems, varying degrees of equipment out of service and equipment launch. You go through the electrical side and something mechanical for the system such as ERCW.

MR. EBERSOLE: For instance, would he have a dynamic consequence if he lost, I will arbitrarily take ERCW.

MR. BYNUM: I think in that case more of the dynamic concept is gone through on the simulator and I think the dynamic concepts are really simulator excercised.

MR. EBERSOLE: And the simulator tracks these time dependent sequences.

MR. MICHELSON: Maybe you missed the depth of the question a little bit. Are you aware how fast the control room heats up if you lose control room cooling.

MR. BYNUM: I think we have done that.

MR. MICHELSON: Your operator would be roughly aware of how fast he would have to do something about solid state control room or cabinet cooling, control room cooling and so forth?

MR. BYNUM: I can't answer the specific question on control room ventilation.

MR. MICHELSON: I think that is the specific question Mr. Ebersole was asking.

MR. BYNUM: I can't answer the specific question but generally those type of things have been done.

MR. EBERSOLE: That is a slow moving phenomenon?

MR. MICHELSON: That is an example of the depth of it.

MR. EBERSOLE: I was getting to things like bearings are going to go in the next 15 minutes if we don't do something.

MR. BYNUM: Again, most of those are covered with the simulator?

MR. MICHELSON: They are?

MR. BYNUM: Yes.

MR. WYLIE: In this area in regard to operational readiness, has there been an assessment of the plant chemistry?

MR. BYNUM: Yes, sir. As I indicated, one of the things that the team looked at in the interfaces with the control room and other activities that really affected operation, radiation control or radiation protection program, chemistry program and maintenance and other activities.

MR. WYLIE: Were there any concerns?

MR. BYNUM: Yes, there were. The concerns, typically the ones that in my experience you find I think the biggest concern, was the communication between the chemistry group and the operations people in the control room on status. What is the status of the systems when chemistry does an analysis? How do they communicate with the control room to indicate what the conditions are?

They noted a problem that the operator really didn't have good trend information so that they could see what direction they were going in. So, we the chemistry department instituted a trend program and those trend graphs are in the control room every day.

The shift supervisor reviews them every day.

So things like that. I think as far as the technique goes, they did note in some cases that we had some inexperienced technicians and we looked to really beach that area up. We retrained some of the technicians.

We have looked at the shift complements very carefully to be sure that we didn't have all the inexperienced technicians that had not been through a start up before on one shift and things like that.

DR. MOELLER: With your simulator you, of course, are trying to simulate various accident sequences and so forth. In the room in which your simulator is located, can you have it go on emergency HVAC situation and have that room heat up like the true control room would heat up and then simulate various electronic components failing one at a time?

MR. BYNUM: No, to my knowledge you cannot simulate the loss of the HVAC's. You can, of course, take out selected control room components and fail them. But as far as the HVAC, you cannot simulate the loss of HVAC. There is no program in the machine, to my knowledge, that would say these are the components that would fail first in that event.

MR. MICHELSON: That was a slightly different answer than I thought you gave me just a minute ago.

MR. BYNUM: Okay.

MR. MICHELSON: Even though you don't heat up the simulator room, I thought you said your simulations included such affects.

MR. BYNUM: I was talking basically about the bearing failures and motor failures and pump failures.

MR. MICHELSON: That I agree with. We are talking about a slightly greater thing which might be the first thing to happen to you. You don't know. You haven't looked.

MR. BYNUM: Let's look at each area and talk about some of the corrective actions.

DR. REMICK: Can I ask you a question about the reviews. I assume that the INPO assist included SRO's.

MR. BYNUM: That is correct.

DR. REMICK: Would you give me an overall feeling of the ORR composition that came. Some of them came before the subcommittee recently. How about the general composition.

MR. BYNUM: The general composition was pretty much as Frank's background. It was in the military and the Navy. There were a couple of individuals who did have commercial experience who came from commercial utilities. I think in all there were seven people. I think there were three that had commercial experience and some came from laboratories and some came from the

Naval program.

DR. REMICK: Were were there any specific pier evaluators?

MR. BYNUM: No.

DR. REMICK: But people with commercial backgrounds?

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

(Slide.)

Organizationally, one of the first things we did was we formed the management duty roster. Essentially, what this is is we went to each department that was critical to supporting the operations and we assigned a duty roster so that an individual on off-shifts was always on call, was always available to address whatever assistance was needed for that group.

We formed the management duty roster and it includes RAD control, chemistry, nuclear engineer has several members on their duty roster to give response.

Mr. Wylie indicated one of the other things that we are actively pursuing is going to an on-shift plant manager concept. We have not implemented that as of yet. We are trying to identify the individuals to put in that position and eventually he would function on the back shifts just as the plant manager functions on the day shift.

We looked at the organization and we did two things. One is we reduced some of the layers of management and we increased the number of field supervisors. It may seem that those are contradictory when in fact they are not. What we did was we reduced the number of layers in order to facilitate communications.

But in some cases, particularly in the areas of RAD chemistry, we took individuals who were in lead type positions and made them formally supervisors as such so that they could be held accountable for the performance of their shifts. So, we felt like we got better communication through reduction of management layers and then we got better accountability in the increased number of field supervisors.

We made the transition to what I will call the owner operator concept. We made the transition to where the operator was clearly in charge of the unit, in charge of the equipment. We have actually taken that down all the way to the assistant unit operator level where if maintenance or modification or anyone is going to work on equipment in that individual's area of responsibility, he knows about it, the control room knows about it.

So we have made that transition no longer design and modifications phase plant and operations phase plant. Participation in training, one of the things that we have done is set up a management roster up to and including myself where we go to the simulator and in fact watch simulator exercises ourselves. We essentially critique the critiques.

DR. REMICK: Do you participate in the tech staff and manager's training program?

MR. BYNUM: We have not as of yet. We are concentrating right now on the operator program. I certainly think we will in the future. But right now the real focus is on the operator program.

DR. REMICK: How about your PORC members. Do they attend that tech staff and managers training?

MR. BYNUM: Some of them have. We are in the process of putting together a special program for PORC members. We can talk about the ANI responses and some of the things we do in that area but we are actually putting together a package that is specifically related to PORC members that talks about 5059 training and safety evaluations and things that are germane to PORC functions.

Root cause analysis, we have a special course in root cause analysis for PORC managers. Communication was a big issue and here are some of the methods that we have used to improve our communication. The daily plan of the day meetings. That is our war room where the status is a continuously run meeting essentially to bring issues up, resolve issues and keep plant status.

We have a daily plant status report that lists all the typical parameters that you see for operating plants. This one I think is unique in that it also lists all of the potential reportable occurrences and it has also got what we call an operations hot list or the items that the operators, in fact, feel like they need to have work expeditiously. So it includes those two things in addition.

We have quarterly meetings where plant management sits down with all the operating staff personnel, all the personnel under the plant manager and then we have totally revised our conduct of operations procedure. Based on the ORR report, a significant part of what we learned from the report was we had not been as specific in a lot of cases as we should have been about what standards we, in fact, expect of the operators. So we completely revised the conduct of operations procedures for operators.

In addition to that, once we complete that, we are going to look at other areas such as maintenance, chemistry and RADCON to look for a similar conduct of operations procedure for those areas.

MR. EBERSOLE: Could I speak to communications in a little bit different context?

MR. BYNUM: Yes, sir.

MR. EBERSOLE: I saw someplace in this pile of papers here about some concern about the communication process in the face of some internal disaster like a fire. Since you all had the Browns Ferry fire you got a good background in what to do about this.

The observation was made that communications might become difficult because of damage to centralized communication facilities.

MR. BYNUM: Yes, sir.

MR. EBERSOLE: What I want to hear from you is it doesn't matter whether you blow out the communication room or not. You can still get word around as to what to do in the plant and I hope you will say that?

MR. BYNUM: That is correct. One thing you are doing and I think your absolutely right. We have, of course, radio systems and then we have sound powered phone systems as backups for the regular phone system. So, we have evaluated that and of course that is a part of Appendix R also.

MR. EBERSOLE: Yes.

MR. BYNUM: So we have looked at that. We are attempting to upgrade it from just a maintainability point of view. We are having D and E look at more sound powered lines and some other methods of communication so that we can do that more expeditiously.

MR. EBERSOLE: Have you got an adequate supply of radio?

MR. BYNUM: Yes we do.

MR. EBERSOLE: And they work?

MR. BYNUM: Yes. We have had radio surveys done throughout the plant.

MR. EBERSOLE: Thank you.

MR. BYNUM: In fact, that is where some of the sound powered phone jacks we specifically put in areas where radio communications was difficult.

MR. EBERSOLE: Related matter, do you have enough light around the plant to do what you have to do.

MR. BYNUM: Yes, again we have done the typical Appendix R walkdown to make sure you have adequate light.

MR. MICHELSON: Did your Appendix R walkdown consider the problem of smoke in the areas when you evaluated adequate light?

MR. BYNUM: I'm not sure of the specific results of that. I couldn't really answer that question.

MR. MICHELSON: That would be, of course, a consideration if you were trying to mitigate a fire?

MR. BYNUM: Yes.

In administrative controls areas, we are in the process of revising our administrative procedures to eliminate procedures, to eliminate where there is overlap to get a consistent hierarchy of procedures both from the corporate level on down into the plant.

(Slide.)

We have just recently implemented a change to Section 6 in technical specifications. We have got the typical specification now that most plants have on qualified independent reviewer. I think all of the new tech specs are in that vein. We have implemented those at Sequoyah and as a result of that are going through our administrative procedures to make the necessary changes and corrections. Obviously, we conduct training on the procedures as they are approved.

On-shift observations, one of the problems that we share with everybody else out there is on-shift observations by management, getting management out in the plant, out in the field. Admiral White would call it walking our spaces. And one of the things we found is that people really don't know how to do that. Even once they get out in the plant, they really don't know how to effectively do an on-shift observation.

So we spent a lot of time with our first line managers and supervisors in really training them on how do you do a good on-shift inspection observation and what kind of feedback is utilized.

(Slide.)

As I indicated we have updated our standards of observations again. We have just revised our AR30. We are in the process of changing our administrative control procedures and consolidating those and simplifying them. One of the other issues that came up in the ORR report were the qualifications of assistant unit operators.

There was a concern that in some cases they did not feel that the assistant unit operators, were really as familiar with their particular watch station as they should have been. What we have done, is we have taken a couple of significant actions. One is, in reorganizing, we have split out the duty stations of the auxillary unit operator into two basic sets. One basic set is a typical power plant auxillary unit operator stations in the control room, the turbine building, the aux building.

And then we have taken the water and waste treatment water plant, RAD waste and separated those so we now have two distinct groups of auxillary unit operators and they, in fact only cover those watch stations in their particular group. But essentially, cut in half the number of watch stations that AUO is qualified for.

We also are having a complete recertification program of our auxillary unit operators. We have developed a check sheet and a walk-through for each of our selected individuals from the training center to come over and actually give the AUO's a walk through and oral exam on each watch station to certify them and that will all be completed prior to restart.

DR. REMICK: Your task analysis could be interpreted as not being very good or I could interpret that these people have too many systems that they are responsible for and cannot possibly know all of them.

MR. BYNUM: There are two basic problems and the latter is more close to the situation. Two distinct problems that we found, there were so many AUO watch stations, I think there were 11 or 12 watch stations. There were so many of them and also it was very difficult. In fact, we did not track when the last time a certain individual worked on a certain watch station.

So you may have run into a situation where you had an individual who had not worked a watch station for maybe 8 or 9 months having to be assigned to that station to run it. The familiarity level just was not there.

DR. REMICK: Then I can interpret that your continuing training programs for unlicensed operator in picking up the tasks--

MR. BYNUM: Well, that is a part of it and that was the other thing that we put in the program is we have gone back now that we have reduced it we can cover those things much easier with a smaller number of watch stations. Your observation is correct.

MR. EBERSOLE: Do you rotate the AUO's around the plant until they virtually know all the systems?

MR. BYNUM: Yes, we do.

MR. EBERSOLE: And that is his educational process?

MR. BYNUM: That is correct. And again, we used to rotate them through all 12 stations. Now we basically rotate them through the six stations that are in their area. We probably, in the future, will get to the point of taking individuals from each of those and putting them in the other areas. But when we do that, it will be on a long term basis.

It won't be for a week over there and a week back in the turbine building.

MR. EBERSOLE: With all this focus on operator qualifications, yesterday we were hearing about the onset of similar considerations and maintenance.

MR. BYNUM: We are looking at some of the same things in the maintenance here, particularly some of the communications training and some of the proficiency training we are looking at also in the maintenance area and in the chemistry area and in the RADCON area.

MR. EBERSOLE: Do your maintenance people have documented qualification certification for whatever they do?

MR. BYNUM: Yes.

I mentioned already the RADCON shift assignments and chemistry staff shift assignments. We did take the lead individual and put them in the supervisory status so that we could get better accountability on a shift basis and improve the communications between the control room and those staffs.

Demonstration performance, obviously one of the things we want to know is how well are we doing. That is part of the reason we are into this heat up phase now to really look at how much improvement in fact have we made since we got the report in October. We are really measuring that two major ways. The first way is that we are using shift operations advisors.

These are previously licensed SRO's from other utilities that are now working with TVA and we put them on a rotating shift and they have essentially a checklist and they observe shift turnovers. They make specific observations on communications. They make specific observations on several other typical items, enunciator responses, things like that. And then at the end of the shift, they actually turn into the plant manager a sheet that summarizes their observations, what they observe and the sense of what they observe.

In addition to that, as I mentioned, we of course have a lot of management attention in all the operating areas. Admiral White is on site full time. Myself and Charlie spends most of his time out there. So we have a lot of management involvement again on shift looking at all the operations.

MR. FOX: For example, a point that Joe passed over quickly that is very important, we have that operational readiness review team on the site. In fact, they are going through around the clock coverage observing RADCON operations. So they are following up to make sure that the observations that they made back in the late summer and early fall are, in fact, correct. They are still very active and they are reporting directly to Admiral White the progress that they see, areas where additional attention is needed.

DR. REMICK: Is that a full time team?

MR. FOX: Yes. Our corporate maintenance manager for example, Jean Rogers, is in residence almost full time at the site. George Toto has put someone else in charge of the site at Watts Bar and he is spending more time there. He is on the ORR team. As is Frank Fogerty and the rest of them.

MR. BYNUM: There is also a permanent follow-up essentially to the ORR is the NMRG, Nuclear Management Review Group and that group has reviewed the responses and they are including as a part of their ongoing activities, looking one at the simulator training that we are doing now. We are doing two things in simulator training. One to address some of the INPO comments and the other to address some of the ORR comments.

But in week one of requal is going on right now for the operators, one of the INPO comments was that we did not have all of the emergency operating procedures that were recommended by Westinghouse. There were about eight of those that we, in fact, did not have. We have incorporated five of those into our emergency operating procedures.

The three that we don't have and really there

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are two, we have technical justification really for not including those. We don't feel that they are applicable to Sequoyah. We have implemented those emergency operating procedures and are now training on the simulator.

In addition to that, the holes that INPO saw in their simulator evaluations, a couple of them had to do with approach to criticality, shutdown margin calculations, things like that. We are doing a three day, 10 hour a day session with each operating crew to go over specific start up evolutions and that training is currently ongoing right now. NMRG is overviewing all of that training.

DR. REMICK: Did you say that your operator requalification program that you referred to in total is performance based or is it still proscriptive following the old Appendix A to Part 55? Have you made the transition?

MR. BYNUM: We are in the transition of becoming performance based. That was one of the comments that INPO had was that you really don't do things in the simulator really exactly like you do them in the plant. You don't even have exactly the same compliment of people when you run a simulator exercise that you have on shift at the plant. And we didn't do enough critiques on communications and leadership and those types of things.

So that is one of the things that we are emphasizing not only at week one requal but also in the special 3-day start up training that we are giving. That is one of the critiques that we are doing, NMRG, the management individuals such as myself that are involved, that is one of the things that we are, in fact looking at. But we are in that transition to get the performance based evaluation.

DR. REMICK: You are reviewing those critiques and observing the teams and getting your own impression of the capability?

MR. BYNUM: That is correct. We took INPO's overall evaluation, as I said, was pretty positive. They did have problems with one specific crew. They indicated that essentially all the crews were above average with the exception of one and we actually made some personnel changes for that particular crew and have some people in communications training and assertiveness training right now. But we reconstituted that crew.

MR. FOX: One other item, Joe mentioned it briefly. INPO is also going to conduct a follow-up session. Pat Beard is going to personally lead the team back into the site. Is that next week?

MR. BYNUM: That is right. I believe it is next week. It is at least within the next couple of weeks.

MR. FOX: We are working out the final date. They are following up on the findings that they had last fall when they came in in conjunction with the operational readiness.

MR. BYNUM: Any other questions?

DR. MOELLER: For an evaluation such as the one that INPO does and has done and is going to do, I gather they must send a different team than they send to an operating facility?

MR. FOX: I can't really comment on that.

MR. BYNUM: I think it was essentially the same. The people that came to do our simulator observations were essentially the same types of individuals that you would see at INPO. They were heavily loaded in the operations area obviously but they were essentially the same type of people you would see at an evaluation even though it was an assist visit, essentially the same people.

DR. MOELLER: Thank you.

MR. EBERSOLE: Let's put the shoe on the other foot. Let's ask how you rate INPO and its field of questions? Do you think they do a thorough and penetrating job of examining deficiencies in degraded states, for instance?

MR. BYNUM: In our case I think they did a good job. I really do. In looking at their report, interestingly enough, the ORR team and some of the interviews that the ORR team had conducted, they came up with some of the same weaknesses and through some of their observations too. I think they did a good job in our case.

CHAIRMAN KERR: Mr. Bynum, do you consider operator inattentiveness or possible sleeping on the shift acceptable?

MR. BYNUM: No, sir.

CHAIRMAN KERR: There is some indication, it seems to me at at least one point, that this did occur for a long time without anybody being aware of it.

Is there some way that you think you can detect that or make reasonably certain it is unlikely to occur?

MR. BYNUM: Well, I certainly think with the concept that we have of the on-shift plant manager and the on-shift supervision that we have, I think that we certainly would know if anything like that were going on on any type of a consistent basis. Obviously now, we have NRC people around the clock. We have management people around the clock.

We have just no question in my mind right now, we obviously have to look down the road to be sure that we have an ongoing program that insures that we have attentiveness to duty. But I certainly think that is something that is really not hard to do.

MR. EBERSOLE: Well when the plant is running along smoothly and on and on and on, how do you keep the people's springs wound up?

MR. BYNUM: That is a difficult thing to do.

MR. EBERSOLE: Is it a parade of management through the plant with critical questions?

MR. BYNUM: There is no question in my mind there will always be some off-shift management observations from now on. That is a part of operating plants today, no question about that. Unannounced visits, you know, we will have specific instructions out to the security pecple that they don't call the control room and tell them the Admiral is on site or the plant manager is on site and things like that.

Those are pretty much standard activities in most operating plants as a result of the incidents that you have talked about.

MR. WARD: You mentioned the on-shift plant manager. When do you expect to have those positions filled?

MR. BYNUM: Well, we are going to try to do it before the end of the year but that may be ambitious. It really depends on the availability of people that really have the necessary qualifications to fill those jobs. I think in this interim time again there is so many observational activities in that control room that there is no question in my mind that aspect is going to be more than thoroughly covered.

DR. REMICK: What are the qualifications these people are supposed to have?

MR. BYNUM: We are looking at that right now. We haven't set the specific criteria but we are looking. Obviously, they have do be similar to the plant manager as described in ANS 31. It will be similar to that. Whether we will stick exactly to that or not, I don't know. But they will have to be similar to that.

DR. REMICK: And who do they report to?

MR. BYNUM: Well, they report to the plant manager.

DR. REMICK: Not the shift supervisor?

MR. BYNUM: No. The shift supervisor, in fact, really reports to them. It is a back shift organization that parallels the day shift organization.

CHAIRMAN KERR: I listened to the presentation which I must say I think is very good. The philosophy is one that I would call top down management. There are those in the reactor area necessarily who think that one can improve employee's morale by having team participation and participation at all levels. Have you given any thought to that? Do you think that is appropriate?

MR. BYNUM: Yes, certainly. I certainly do. One of the things that we found out and I think a lot of 16 it is the phase that we are going through. A lot of things are happening in parallel at just the right times. Particularly I'm speaking of Sequoyah, one of the things that I found and you have to realize my experience is a little bit unique in that I was with TVA for 10 years and then I left TVA in 1982 and was plant manager at Palo Verde for five years and have just come back. So my viewpoint is a little bit different from a lot of people.

But one of the things that I noticed in coming back that encouraged me was the attitude of the people in the trenches. They really wanted some good strong leadership. The operations people, in particular, wanted some support. They wanted to be in charge. They wanted to have the standards set for them and they wanted to be held accountable. That is one of the things that we found. There was really an eagerness.

So we established some of the things. We didn't really get a lot of the resentment and a lot of this is crazy, this is all Navy stuff and doesn't really apply to the commercial business. I expected more of that, to be quite honest, when I came in. We didn't really find a lot of that.

We found that people were really eager to have high standards, to have the standards set for them. So now that we have done that part of it, the interface with the people, getting out in the plant, talking to the operators, talking to the maintenance people and getting their feedback and in using as I indicated the quarterly meetings, we are taking their feedback now and trying to figure out how we can make the systems, the procedure system, the administrative controls and those types of things responsive to helping them get their job done.

And I think they recognize that that, in fact, is our attitude and that, in fact, is our intention and they are responding very well to it:

DR. MOELLER: Why did you leave and why did you return?

MR. EBERSOLE: He didn't like CE. No PRRV's.

MR. BYNUM: I remember that issue well. The reason I left was for the opportunity. I was Assistant

Plant Manager at Browns Ferry and I was offered the plant manager's job at the largest nuclear plant in the country. So as a professional opportunity for me, it was one that you just couldn't turn down.

Coming back, I guess I was impressed by what I saw TVA doing. I first interviewed with Mr. White in January, I guess, of '87 and I talked to a lot of the people that I had known before. A lot of the people I had worked with. He had his list of who he wanted me to talk to and I had my list of who I wanted to talk to. And so when I interviewed Palo Verde Unit 1 and 2 were both commercial at that time and were getting ready to license Unit 3.

I really didn't get a good feeling that there was as much support, as much backing, that really people in the right places were convinced that things were going in the right direction and I turned the job down. And once we got Palo Verde Unit 3 licensed, things were winding down there, I went back and interviewed again. And I was amazed at the change just in the seven or eight months.

I got a real sense that people were pulling together. They were beginning to see the light at the end of the tunnel. That is the other thing I think is happening, when you talk about operational readiness,

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one of the important keys is we are now getting into an operation phase. So we are putting the operators in charge. That is where they belong. That is the phase that we are going into in the life of the plant.

I was at Sequoyah for the startup of Unit 1. At TVA I was at the startup of Browns Ferry 1 and 2 and Sequoyah 1 and this is the typical phase that you go into when you put the operators in charge. I think the ORR report was perfect timing. We were going into that phase. We were able to make that transition and when you expect more of the operators, you also have to give more. We gave them more authority over their plant, authority over their equipment and put them in charge so that it all came together at the right time.

DR. MOELLER: Thank you.

MR. BYNUM: Any other questions?

(No response.)

MR. WYLIE: Thank you, Mr. Bynum.

Mr. Fox, let me just say that I have discussed with the staff and their presentations will not take very long. So I think that it is important that we hear from you. And so I would say if we could leave about ten minutes, which would make it 10:20, you will have that much time.

MR. FOX: Okay. You want us to go ahead then?

MR. WYLIE: Yes.

MR. FOX: Our next speaker is John Kirkebo. John joined us last year from Stone and Webster. He was one of the original people that came down to TVA with Admiral White helping to find corrective action to fix problems. We were very fortunate to have him join us about a year ago as a permanent employee. The people you are going to hear today all wear the blue badge. They are all TVA employees.

I was reading some ACRS transcripts and I notice that almost all the speakers were loan managers or advisors from other companies. Every one you are going to be hearing from today is a permanent TVA employee.

MR. KIRKEBO: Thank you, Charlie.

This morning I'd like to give a brief overview of our calculation program for the design calculations for Sequoyah Unit 2 and common facilities. I think the objectives of the program as outlined on this viewgraph clearly define that the calculations effort for Sequoyah touched significant issues, i.e, confirming that we have the complete scope of design calculations available and that they exist.

(Slide.)

Secondly, to assure that those calculations are technically adequate to be performed, technical reviews on the calculations. These calculations were reviewed by TVA personnel and by contractors specifically from Bechtel, Sergeant and Lundy, Stone and Webster and other contractors were called upon by TVA to perform technical reviews of the design calculations.

DR. LEWIS: Forgive me for my ignorance. This is segregating calculations no matter what the calculations are as long as they are involved in the plant. I guess I have never seen information segregated in that way before. It is usually segregated by function. But anything that involves a calculation which is defined as an addition or subtraction, I'm really confused.

MR. KIRKEBO: Let me establish a little broader base for the presentation.

The calculations that I'm referring to are the design calculations that were prepared to support the technical adequacy of the design going back to the original time when the plant was originally licensed and before licensing to the design process. In other words, we are talking about the calculations in the various engineering disciplines, civil, mechanical, electrical, nuclear. A scope of design calculations that was required to support the drawings, required to support specifications, required to support the configuration of the plant from a design perspective.

DR. LEWIS: So this excludes those design features which do not require a calculation? That is what I'm confused about.

MR. KIRKEBO: As you will hear in other presentations, there are other programs that were accomplished by TVA and looking at the other areas of the design, other areas of engineering work.

The specific remarks that I'm making are associated with that set of necessary calculations to support the design and in general, the design is supported by calculations. The whole design is supported by calculations.

Did I answer the question?

DR. LEWIS: Well, yes and no. Yes, you have done your best to answer the question. I will stipulate that.

MR. KIRKEBO: Let me, again, go through the a elements of technical adequacy as part of the program. Technical reviews were accomplished. Some assumptions were characterized as unverified and unverified assumptions were resolved during the calculation program by revision of the calculation to docurent the technical adequacy of the assumption.

The calculations were integrated. In other words, we developed a matrix which tied the results of one calculation into the input of another calculation. We refer to that as our calculation cross reference system or CCRIS as you see referred to on this viewgraph.

A final element of the calculation review was ensuring that the calculations support our license, to ensure that the calculations are reflective of the conditions that the license contains.

Finally, in some cases, the corrective action in most cases the corrective action consisted of regeneration of the calculation, revision of the calculation and in some cases, actual hardware modification.

The next viewgraph provides a chronology of the events that constituted our calculation effort. Actually TVA started this program early in 1986.

(Slide.)

The program was initially started in the electrical discipline and then expanded to include all major engineering disciplines.

MR. MICHELSON: Could I ask a question?

MR. KIRKEBO: Sure.

MR. MICHELSON: I have a little question

sorting out this work which is a sort of a reverification of calculation or establishing a calculation if one didn't exist. How does that differ from this baseline verification and verification program which we are going to hear about next? Why are there two different ones?

MR. KIRKEBO: The baseline program and the calculations effort supplement each other to provide a complete set of design documentation and assurance that the design documentation agrees with the physical configuration of the plant?

MR. MICHELSON: Now, did the verification program depend upon this program to make sure the calculations are okay?

MR. KIRKEBO: I think that is a fair characterization.

MR. EBERSOLE: These are TVA calculations aren't they?

MR. KIRKEBO: TVA calculations and calculations supplied by suppliers to TVA.

MR. EBERSOLE: That is what I was getting to.

CHAIRMAN KERR: Which plant is Unit 2 in common?

MR. KIRKEBO: The terminology in Sequoyah's certain facilities support both units and some of the hardware is identified solely with one particular unit. So the terminology Unit 2 in common refers to system structures and components that are required for Unit 2 operation, part of which is considered common facilities required also for Unit 1 operation.

CHAIRMAN KERR: Thank you.

MR. KIRKEBO: The next viewgraph goes over the number of calculations in each of the disciplines.

(Slide.)

DR. MOELLER: What is the calculation and do they not differ in amount of time required and so forth?

MR. KIRKEBO: Absolutely. An electrical calculation would differ from a mechanical calculation as far as the complexity a mechanical calculation could consist of anywhere from six to 60 pages. A civil structural calculation for a major structure could be 10 volumes of paper. So it is not possible to look at these numbers and gain any type of comparison as far as the amount of effort or the degree because of the various ways the calculations are structured.

DR. MOELLER: Okay, thank you.

CHAIRMAN KERR: But they do make a good slide.

MR. KIRKEBO: They do.

MR. EBERSOLE: Maybe you could describe them in a context if you stacked them up how high would they be.

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MR. KIRKEBO: I think if you stacked them up you could go all the way across this wall many times, many times.

The next viewgraph deals with the corrective action and in the interest of time I would like to go through the corrective action.

(Slide.)

There are two slides on corrective action.

(Slide.)

This one is associated with all the corrective actions on the previous base with the exception of pipe supports for piping. As we can see 70 percent of the calculations were okay. 4 percent needed to be revised and the balance were regenerated. The bottom line as far as hardware adequacy is much less than 1 percent of the calculations caused modifications to the Sequoyah hardware.

DR. LEWIS: Could I understand the 70 percent a little bit. 70 percent were okay means that the second pass through got the same answer or what?

MR. KIRKEBO: It means that the calculations were reviewed. The technical approach for the calculations, the assumptions for the calculations, the methodology, the way the calculation was accomplished was appropriate for the result or for the intent that the calculation was accomplished for. In other words, you have a calculation designed to size piping in the fluid system. You have another calculation prepared for the purpose of designing the reinforcing steel in a mat or in a wall.

We went through the calculations to assure that the calculation, one, contained a complete scope of technical information to support the conclusions. Secondly, that the methodology was adequate. So I think the answer to your question is yes.

DR. LEWIS: But I'm trying to understand if you had written that 30 percent of the calculations turned out to be wrong, would I then be extremely concerned? Is that what you are saying but putting a nice spin on it? I don't mean that to be a nasty crack. I'm trying to understand.

MR. KIRKEBO: I think if you view calculations as documentation to provide assurance that if the design is totally supportable and I think that is the function of calculations. If standards that we have today are different from the standards that existed when the calculations were originally prepared.

I don't think it is possible to draw any type of message as far as significance. As we all know, one calculation with a very minor problem in it could have a significance. What I'm trying to depict here is that TVA has undergone a considerable effort to assure that these calculations exist, are complete and provide the assurance that the design as it exists and the hardware as it exists is supportable.

DR. LEWIS: In fact, you meant well but nobody really doubted. Let me put it slightly differently. Presumably you did this for some reason. You went through these tens of thousands of calculations for some reason. In my experience, for example in writing software programs and things like that, the worst way to find whether there are errors is to have somebody review what has been done before because they make the same mistakes over and over again.

In fact, the only way to assure correctness really is to get a completely different group, put them into a dark room, well not too dark, and have them do it again without any contact with a reference to the people who did it first. Then if they get the same answer you have some assurance.

I'm just wondering whether this program is a result of some reason to doubt the accuracy of the earlier calculations or because they are insufficiently documented to meet the regulatory standards.

MR. FOX: John, let me take a crack at

explaining why a lot of these were regenerated.

One of the problems and one of the weaknesses that TVA has particularly at Browns Ferry and Sequoyah was once the plants got their operating license there was a very poor design control system. There were changes made and those changes weren't fed back to relate the as-designed and the as-analyzed condition of the plant.

So, a lot of this regeneration had to take into account changes that had physically been made to the plant since the operating license was obtained. A lot of those fall into that category. It doesn't mean that the original calculation was done incorrectly. It just means that that calculation wasn't properly maintained as a record. It wasn't properly updated. The communications the operations plant and engineering people left a little to be desired. There was not a good configuration management of the calculations in many instances.

DR. LEWIS: Well I guess the way I should really read this is that you are creating a slice of time library of what the plant is supposed to have been and you are going to have better update control in the future?

MR. FOX: That is correct.

MR. EBERSOLE: Are you saying that after the plant got into operation that there were modifications and changes played which were done by that particular sector of TVA operations but there was no feedback and verification and record keeping to the original designer?

MR. FOX: In many instances that is correct. That fact led toss genesis of the design baseline and verification program. You are going to hear from John Cox in just a moment. That program was aimed primarily at taking the change paper that occurred since the OL and bringing that paper up to current day.

MR. EBERSOLE: It is interesting that 30 percent of the calculations were changed?

MR. FOX: I'm not saying that it was the entire amount. I'm saying that a large fraction of the regenerating calculations were to incorporate changes that were made since the operating license was obtained.

MR. EBERSOLE: Is the fact that 30 percent were changed but there was only one percent physical result of such change evidence that those people who made the change utilized this knowledge of margins or conservatism?

MR. KIRKEBO: I think that is one valid conclusion. Yes I do.

MR. EBERSOLE: Did you find you had to eat into any margins that they had thought were there.

MR. KIRKEBO: I think that the modifications that were made that were not documented, I can't draw a general conclusion in that respect.

MR. EBERSOLE: I notice you have an asterisk on pipe supports.

MR. KIRKEBO: Well, the next viewgraph is on pipe supports so let's move to that one.

MR. FOX: Let me mention one quick point on regenerations. John is going to cover a number of missing essential support calculations. When we pass through the essential calculations that were required to support the Chapter 15 safe shutdown and accident mitigation systems, we found missing essential calculations, calculations that couldn't be retrieved in the electrical and mechanical and nuclear disciplines as well as the civil.

The principal area where we were missing most records was essential but we also had to regenerate missing essential calculations in the other disciplines as well.

MR. MICHELSON: What fractions were missing?

MR. FOX: In the civil support area almost all of them.

MR. MICHELSON: I'm thinking out of that 30 percent that weren't okay what fraction weren't okay because they were missing.

MR. KIRKEBO: That is regenerated.

MR. FOX: I can get you that number.

MR. MICHELSON: I got a sense that regeneration was when they went back and brought them up to date.

MR. FOX: No. Let me clarify that Mr. Michelson. What I'm saying is that there were certain calculations that hadn't been properly maintained with the proper design control methods. In addition to that, there were calculations that weren't retrievable. That population includes some of both.

MR. MICHELSON: My question was pretty straightforward. What fraction were nonretrievabvle.

MR. FOX: I will be happy to get you that number.

MR. KIRKEBO: It is right there. It is 26 percent.

MR. MICHELSON: I'm getting two answers. Regeneration doesn't mean it was nonretrievable. It means it was either nonretrievable or was retrievable without data.

MR. FOX: We can answer that question. We have the numbers.

MR. MICHELSON: I'm sure you do.

MR. FOX: In fact, we presented them to staff in a number of views.

MR. WYLIE: We need to move along because we have got about 22 minutes for the rest of TVA's presentation.

(Slide.)

MR. KIRKEBO: The next Viewgraph is associated with the rigorously analyzed large core pipe support. Here is where 100 percent of the calculations were regenerated. The calculations did exist at one time. The calculations had been destroyed.

They were regenerated to the appropriate design criteria. The results of the regeneration of the calculations as indicated, number of modifications were required, some prior to restart and some following restart.

MR. EBERSOLE: Had those been done in the design sector or in the operations sector?

MR. KIRKEBO: These calculations that we are referring to here had been accomplished in the design responsibility.

MR. EBERSOLE: What did they do, throw them away?

MR. KIRKEBO: Yes, sir, they threw them away.

They were accomplished by contractors, suppliers to TVA and TVA, at some time in the past made the decision that it was not necessary to maintain these calculations.

MR. EBERSOLE: I'd like to know who made that but I'm not going to ask.

MR. FOX: It is a documented trail that is very clear.

MR. KIRKEBO: On the final viewgraph just to overview the objectives of the calculations program. I think I have touched upon each of these.

(Slide.)

In the area of overall corrective action I wanted to touch upon two things that are indicated here. First of all TVA has modified its procedure for reviewing calculations and to insure that the calculations prepared today are revised today, to get a truly independent review.

Secondly, that the calculation responsibility is no longer vested within a headquarters branch but is now, that responsibility rests with a dedicated team of project engineers assigned to each of TVA's particular projects.

MR. EBERSOLE: You are speaking to Sequoyah 2 at the moment. Is what you are saying all so applicable in the future to Sequoyah 1 and Watts Bar and Browns

Ferry and Bellefonte?

MR. KIRKEBO: Yes, sir, it does apply.

MR. EBERSOLE: In short, THERE has been a drastic revision to the whole organizational structure.

MR. KIRKEBO: Yes, sir, it is totally applicable to all TVA facilities.

MR. EBERSOLE: Okay.

MR. KIRKEBO: Any further questions.

CHAIRMAN KERR: In your view has the risk to Sequoyah been significantly decreased by this rather elaborate program that you have completed?

MR. KIRKEBO: I think the best way to answer that question is to say that we have objective evidence of the nigh degree of confidence and assurance that the plant design is safe and that the plant configuration reflects the configuration of the plant.

CHAIRMAN KERR: That is a good way to answer a question I didn't ask. If you prefer not to answer it I guess I can understand.

MR. EBERSOLE: Bill wants some numbers for PRA.

CHAIRMAN KERR: I didn't ask for that. I asked if he thought there had been a significant reduction in the risk.

MR. KIRKEBO: In my view as a newcomer to TVA I came in with some personal feelings as far as the risks associated with the operation of any TVA plants. As a result of the efforts, part of which is the calculations effort, I feel confident. I felt confident coming in that there was a lot of work that had to be done. We have done a lot of work and I feel that as of today we have safe designs and we have the assurance that the design is safe.

CHAIRMAN KERR: Thank you.

MR. WARD: There were about 100 hardware changes that result this program, I guess, if I understood your numbers on pipe supports were those all pipe supports.

MR. FOX: The 100 that he mentioned a moment ago were pipe supports.

MR. WARD: Where you show 1 percent hardware--

MR. KIRKEBO: There were modifications in the electrical and mechanical area in addition to the modifications to the pipe support.

MR. FOX: The 100 that I was speaking to were associated with pipe supports those were restart items and pipe supports.

MR. EBERSOLE: While you were doing this it was being found that the pipe supports were too rigid anyway. Where did you fall in this unfolding evolution of consideration of flexibility or rigidity in pipe designs?

MR. KIRKEBO: I would like to have Carl Seidler, our Assistant Civil Branch Chief address that question as far as rigidity and where TVA stands in the overall area.

MR. SIEDLER: Sir, it is an industry-wide question. I don't think there is a real good answer for it. Basically, what we did was we designed to flashing criteria. We did not get into stiffness. That was not part of the design basis of Sequoyah and personally I feel that when you get into that, it is not a wise thing to do. There are other simpler ways to treat that problem that assure that the primary operating conditions of the plant are adequately addressed.

MR. EBERSOLE: Did you get rid of that in Sequoyah?

MR. SIEDLER: We did not do any support optimization during that program.

MR. EBERSOLE: Thank you.

DR. LEWIS: I want to take a crack at rephrasing your answer to Dr. Kerr's question a little earlier. So I'm on your side and you tell me whether I phrase it incorrectly.

I believe that your answer was that in fact the recalculations have not, in your view or you don't have any reason to believe that they have reduced the risks but you have good reason to believe that they have increased your assurance that the previous estimate of the risk was the right one?

MR. KIRKEBO: Yes, sir.

DR. LEWIS: If that is a reasonable interpretation let me go on with a question. Is the same statement true of the hardware modifications that have been made as a result of the recalculation program that they probably have not decreased the risk but that they have increased your assurance of what the risk is, is that true?

MR. KIRKEBO: Yes, sir.

DR. LEWIS: Is that a better answer to your question? Never mind. I can't ask you questions, I am the chairman.

MR. KIRKEBO: Any further questions?

(No response.)

Thank you.

MR. FOX: John Cox, project engineer on Sequoyah is going to speak for about five minutes on the design baseline and verification program. Then we are going to spend the rest of the time on IDI lessons learned. We are still discussing and trying to resolve NRC concerns of the staff on the diesel and we will defer to them to cover that during their part of the presentation.

MR. COX: I'm John Cox. I was the design baseline program manager during this effort and I'm going to quickly try to carRY you through this for the sake of trying to keep it to five minutes.

(Slide.)

The design baseline program was established to take care of a number of design control weaknesses. I think Mr. Fox addressed a number of those a moment ago in the question about the design program, design baseline and the design control process. It was a very extensive program that encompassed over a year of activity by an equivalent number of 300 to 400 people.

MR. MICHELSON: What is the time frame?

MR. COX: The time frame was May of '86 to June or July of last year. We expected about 650 manhours in the effort. The objectives of the program, I'm going to cover two bullets at the same time.

(Slide.)

They are covered in the nuclear performance plan and the major things I'd like to get across is that we have reestablished the design control process. My next slide I'm going to go into that in some detail. The objectives of the design baseline verification program was to obtain a design baseline and to be sure that the modifications post OL did not degrade the systems evaluated.

(Slide.)

The elements of the program that are covered, this is a slide on the design change control process and I want to deliberate on this in a little more detail than some of the others because I think that the subcommittee asked that we cover this which I did not cover in the subcommittee. The first thing I would like to talk about is we had some weaknesses in the design control process by issuing changes on a drawing by drawing method. We now issue these on a complete engineering package.

We also have weaknesses with regards to a two drawing system which we had as designed and as constructed drawings and we now have a process by which we are going to a single drawing which we call a CCD or configuration control drawing and we also are doing field walkdowns of every change package that we are looking at.

MR. EBERSOLE: But there will always be a lag time between the drawing and the ongoing document?

MR. COX: Absolutely.

MR. EBERSOLE: What kind of lag times are we talking about?

MR. COX: We have a real time basis, Mr. Ebersole associated with marking up of control room drawings so that the operators, as soon as we get varifications that a change has been implemented, we get a mark up almost immediately on the thing. So that is actually a red line process.

MR. EBERSOLE: So sometime later on it is documented in the permit?

MR. COX: In a CCD permit drawings.

MR. EBERSOLE: How long does that take?

MR. COX: We are in a backlog process of catching up in that process. I personally don't know what that process will be. I know we had a very aggressive program to make that time as short as possible.

MR. EBERSOLE: Thank you.

MR. COX: We have established a change control board which we view every change coming into the processing for the the plant also. We had a large volume of changes before and so this CCD is a screening process.

We also had a weakness associated with the fact that the scope of the changes was very large for each ECN package. So we are limiting the scope to be what we call a bite size package. And finally, the design engineering organization does maintain design integrity or design authority over the change control process.

MR. EBERSOLE: Well, when you close out a system to do a change and it is dead for a time, you make the change, you must inform the operator before he reinstalls the system or puts it back in operation.

MR. COX: That is correct.

MR. EBERSOLE: Do you have a routine for doing that?

4 MR. COX: That is a part of the process, part of the authorization or approval process by modifications that a design package has been worked, that design has bought off on it and it is in an operable state.

MR. EBERSOLE: Does the operator certify he now knows that R15 is pertinent rather than R14? Does he have some way of documenting he understands the last R number?

MR. COX: Maybe Mr. Bynum could address that or Mr. Hausner.

MR. HAUSNER: My name is John Hausner. What we do is as soon as the test is complete on the field work package the day that is done the control room primary drawings which number about 900 are marked up with a red pencil. It is called red lining. So as soon as the post mod test is complete the control room operator acknowledges that is complete.

Modifications marks that day on the control room drawings, a red line picture of the change. Then within 15 days we issue a drawing that shows that change. That is our requirement, 15 days. We struggled with that a little bit but 15 days is our primary drawings.

DR. REMICK: How do you get that into the operator's initial and continuing training. You must send copies of that to the training department?

MR. HAUSNER: I will try to address that also. Mr. Smith who is our new plant manager has asked us to simultaneously mark up the sets of drawings in our response center. So at the same time we mark the control room drawing we mark up the plant training center drawings and emergency center drawings. That is the commitment we have now.

DR. REMICK: But somebody has to pick that up and say we are not just worried about the people on the shift at that time. We are talking about the people that you have that might be away from the plant or on vacation at that time. Somebody has to decide we are going to incorporate this into continuing training and initial training. What is your mechanism for doing that?

MR. COX: John, the question was what is the mechanism for that and I'm not familiar with the mechanism.

MR. HAUSNER: I can't answer that.

MR. FOX: Here is Mike Sidlacey.

MR. SIDLACEY: Mike Sidlacey. The work plant process itself has a provision in the operational review of the work plant before the work is initiated that is sent to the operations department. They assess whether or not any training must be performed, any procedures must be changed prior to the plan being issued.

Once the work plan is executed it returns back to the operations department for them to sign off. They have change procedures and they have initiated the training and this is prior to system operability.

DR. REMICK: Thank you.

MR. MICHELSON: At the time of the subcommittee meeting we discussed this same subject and I asked for an example on namely auxillary control air system.

MR. COX: Yes.

MR. MICHELSON: And to send to me kind of a basic document that I guess you either developed or did something. I received such a document called detailed design criteria and I received our copy issued in July of '86 and the question is is this document written by you people as a result of your work or how did it come about?

MR. COX: It was a result of the design baseline program and I will get into that in my next slide, Carl.

MR. MICHELSON: Is it reasonable to assume then that such a document didn't exist prior to that time or what?

MR. COX: In most cases we did not have documents or documents were not up to date.

MR. MICHELSON: Well, there is quite a difference, of course, between not having them and just not having them up to date.

MR. COX: Both cases existed.

MR. MICHELSON: You don't know which it was. I couldn't tell from this because this is R zero.

MR. COX: If it is R zero the product that we had before just may not have been sufficient to be revised.

MR. MICHELSON: I think I have seen the product before. It is a strange numbering.

(Slide.)

MR. COX: These are the major programs of the baseline program. We established an EAO review team initially that was with the program from start to finish. There was about a 17 man program that was there full time looking at every element of the program. The first major element was that we did review all of the licensing documents, correspondence and so forth to establish regulatory requirements and licensing commitments.

We incorporated these in the creation of design criteria for all the safety systems that were designed to mitigate design events and that was the scope of the program that we were looking at for the design baseline program. Once the criteria were established, and during this process we were doing system walkdowns, a functional walkdown of each of the safety systems under the scope of the program.

With respect to electrical areas, we actually started with the preop test results and looked at all of those as a baseline and then looked at all of the post modification testing results that were done. The next element was that we looked at all the post OL changes to th[illegible] lant [illegible] all of these systems and we evaluated them [illegible] [illegible]gn criteria. The changes were assured [illegible] [illegible]eet the design criteria and the design basis [illegible] [illegible]plant.

MR. EBERSOLE: Let me ask a question. I recall a year in which the plant management at Sequoyah, in response to a question did he want a system description and operational concept which is a narrative go along with the drawings, the P and ID and so forth. The response was I don't want anything told to me about how I should operate the plant. All I want is the P and ID's, the elementaries and schematics which was crazy as hell. Has that been fixed?

MR. COX: I believe it has been fixed by the fact that we have established a design basis. We have established a good criteria now reflecting that and I believe our intentions are still and I think now operations wants systems criteria.

MR. EBERSOLE: Do you get it now? Do you get that sort of thing, I will call it system descriptions and operations concepts as a companion document with the elementary and schematics?

MR. COX: Our documents are not system descriptions but I think that that is an enhancement that we may be planning for in the future.

CHAIRMAN KERR: TVA has about five more minutes, Mr. Cox.

MR. COX: Let me make one more point or two. The final major program element was that we did do a system evaluation for each of these systems to evaluate the adequacy of that system to dc its safety function.

We are in the final stages of cleaning up only a handful, maybe 12 testing items remaining for all the deficiencies that were identified from the program. Those will all be cleared up, the restart items before restart. The only remaining items are those items that are heatup testing items.

The last slide depicts the results of the program and acute key points is that we have a design control process in place and that we have successfully reconciled the design control issues as identified in the nuclear performance plant.

MR. MICHELSON: Do design process descriptions exist for each of the safety related systems?

MR. COX: We have not created new system descriptions as the question was before.

MR. MICHELSON: As opposed to design criteria.

MR. COX: Right, we have not developed new ones at this time.

6 MR. MICHELSON: How do you convey the system descriptions to the people who are now going to use the system for whatever reason?

MR. COX: The system that has been conveyed is a product of the previous information that was in place, system descriptions described in the nuclear steam supply system package we got from Westinghouse and in various and sundry ways in design packages, Carl.

MR. MICHELSON: I'm thinking of the air system which we looked at in some detail now. How does the person who has to interface with the air system, where does he find a good description of the air system. I got a good description of the criteria documents It is a good document no problem but I can't tell what the air system consists of.

MR. COX: The FSAR is a good system for that we have not established a system description as such.

MR. MICHELSON: That seems like sort of a shortcoming, just to comment.

MR. COX: Any other comments.

(No response.)

Thank you.

MR. FOX: The next speaker is Doug Wilson, Chief of Nuclear Branch. Prior to taking that system he was the project engineer at Sequoyah.

MR. WILSON: Good morning, I was TVA's IDI engineering team leader primarily at Knoxville. This presentation of the ACRS is intended to acquaint them with the process that we went through and to give them our perspective on the findings that were made in the

IDI program.

(Slide.)

Our goal was to be fully supportive of the NRC. The NRC decided on June 8th that an IDI was required and as I said our goal was to be fully responsive and to determine that any programmatic issues that came out of the IDI review that we would do a broad cross-sectional review of it to make sure that it didn't impact other systems.

We had a dedicated team. We had 25 persons full time with 60 at the peak. We used personnel that were not readily available. They were people that we would rarely spare. For instance we used the lead engineer from Sequoyah itself. We had to make arrangements for replacements for those people. We used our senior engineers at central staff. We had top management involvement. We had a number of high quality consultants.

CHAIRMAN KERR: Mr. Wilson, in light of our time limitations why don't we stipulate the material on the slides. If you have something to add to the slides.

(Slide.)

MR. WILSON: NRC reviewed, as you can see it was in DEPTH. It covered a broad spectrum of issues. The thing that we began with, we began with a walkdown at Sequoyah for a couple of days. We concluded this with a review of design documentation.

Where problems were found in the vertical size we did a broad horizontal section review to make sure that this didn't occur in other systems both at Sequoyah and our other nuclear plants.

(Slide.)

You can see these categories are split into four areas. What we call no deficiencies. Documentations and observations, engineering deficiencies and minor calculation error operations. You can see there are deficiencies and if you add the INC and electrical together you will find that they were fairly well split along this one line.

(Slide.)

Our conclusions are that although there were a number of findings in the IDI area, most of them were resolved by reanalysis. As Mr. Kirkebo pointed out earlier in the case of deficiencies we have initiated a review both for the other systems at Sequoyah and at TVA's other nuclear plants.

TVA believes that the IDI review has indicated that adequate margins do exist as evidenced by the small number of modifications necessary and in resolving the IDI findings we have found nothing which necessitates major programmatic changes at Sequoyah or changes to our nuclear performance plant for supporting restart.

DR. REMICK: Could you give me a couple of examples of the systems of which they took a vertical slice.

MR. WILSON: Yes, sir. We looked at component cooling water systems, raw cooling water systems. The major system that was reviewed by NRC was ERCW. So we looked at the other water system in the case of civil structural items. For instance, when they found a supposed problem with one building, we reviewed all the buildings in category one listing.

DR. REMICK: Thank you.

MR. WILSON: Thank you.

MR. FOX: I would just like to add one remark before you turn it over to Stan. We have answered the subcommittees questions. We have them in writing. We will provide them to the Office of Special Projects and document them through the normal process.

We also have just received a letter from ANI on the recent inspection at Sequoyah last week. We will provide that to the staff along with the answers to the staff's questions and they can provide you copies of both responses to their questions and their most recent ANI letter if that is acceptable.

MR. WYLIE: I think that would be fine.

MR. RICHARDSON: I guess I'd like Eileen McKenna to give our quick follow-up on the IDI.

MS. McKENNA: Good morning. My name is Eileen McKenna, I'm the senior project manager in the TVA Product Division of the NRC Special Projects working on Sequoyah. I will try to be brief on this.

Staff basically had three inspection activities associated with the IDI. It was a major program between July and September which resulted in an inspection report that was issued in November which established the items for which we felt actions needed to be taken. At that time, we were concerned about the number of issues relating to structural capacity and at that point we felt there needed to be a broader look at the overall structural capacity.

And then we had a couple of other specific items that were brought up in the inspection and there were a couple of programmatic aspects with respect to timeliness of corrective actions and system integration. That was based on the information up through September. Staff went back in November and conducted additional inspection with the information that TVA was able to provide or retrieve or regenerate.

(Slide.)

This briefly summarizes the results of that inspection. The result of the information that either was regenerated or otherwise retrieved. We concluded that we did not need to do this comprehensive broad-based review of the structures, the information we found where there were issues in the structural area but the reanalysis, the recalculation were able to resolve those. So we didn't feel we needed to do that initial review that was mentioned in the November inspection.

These were the items at that point that required additional review. You see a lot of them are civil engineering related in specific areas that we had particular corrective actions or sample approaches that we were looking at to confirm the degree of margin that was existing.

(Slide.)

As we mentioned to the subcommittee last week, there was an additional inspection being conducted at that time. I think it was very productive. We are down at this point to a very small number of issues that are still being reviewed. Most of them tie in with the inspection that is going to be conducted next week of the overall civil calculation program which was an issue we had to look at which was going to cover, for instance, looking at the regeneration of pipe supports.

As I say, I think we are down to about 14 items that are not closed at this point, most of which will be looked at next week.

(Slide.)

The general summary I think the staff found from this inspection was that it accomplished the purpose that was intended, that is to provide additional confidence to the staff. That there were no major program issues or problems that hadn't been otherwise addressed. As was mentioned, when a problem was found in the central cooling water system, the generic implications, whether it was a design pressure problem in that system, we looked at other systems to see whether there might be a similar problem there.

As a comment we made that in some cases we felt that in the past there had been refined engineering analyses done rather than relying on putting in an extra and large degree of margin or conservatism. So that required, in some cases, more detailed analysis or review by the staff to reach the same conclusions that everything was an acceptable degree of margin.

As I mention, we have this inspection next week which we hope will close out our review in the civil calculation issues.

MR. EBERSOLE: When you looked at that ARCW system I suppose you noticed that it had an available pressure of 60 feet because of the big flood we had.

MS. McKENNA: I understand what you are talking about.

MR. EBERSOLE: So, when it operates through that range, I believe, how does it cope with the availability and pressure like that?

MS. McKENNA: Well I think that relates probably we have these issues of design pressure and a lot of those issues relate to abnormal conditions where things were operating normally that you didn't have any problems. It was either some component was out or you were in some unusual situation where you might not satisfy the design conditions.

MR. EBERSOLE: You get about 30 psi on discharge with the presence of the flood. Was that accounted for in the fine structure of your vertical slicing?

MS. McKENNA: I really can't answer that question since I wasn't on the team. I think, as I say, if you look at the documentation and the extent of the review that was done those kind of things would be considered but I can't answer your specific question.

CHAIRMAN KERR: Does that complete your presentation?

MS. McKENNA: Yes, it does unless there are any other questions.

CHAIRMAN KERR: I realize that one does these sort of things for other reasons than reducing risk but in your view was the risk significantly reduced by this operation?

MS. McKENNA: Again, I think if you look at the kinds of modifications that were necessitated as a result of this which was a relatively small list, I think we went over it with the subcommittee, I don't know that we can say that we really reduced the risk.

I think another part that you should consider is that this program, in isolation, did not cover everything. Some of the things that were raised in our review in the IDI were coming out of UDVP or calculation programs or some of the other aspects so that the additional--

CHAIRMAN KERR: I'm not trying to be critical.

MS. McKENNA: I understand what you are saying. It is a difficult question to answer to say the fact that you have installed an additional pipe support or made a modification, how much does that actually contribute to reduction in risk is a very plant specific and very judgmental decision, I think.

I think one thing you could say by the fact that the overall program of better documenting situations could lead in the future, since you now understand better what the design basis is is control changes.

CHAIRMAN KERR: As I say, I recognize there are other reasons for doing things than to reduce risk but I'm personally concerned about that because it is also the case that when you go in and make changes to an existing plant there is the chance that you will increase risk.

MS. McKENNA: Yes, I understand what you say. I think that you have to look at what you are going in to modify it for, if there is a specific problem or issue that you are trying to address and to look at some of these interface problems that you go in to fix, pressure problem that you don't induce some operational problem, for instance, yes.

CHAIRMAN KERR: Thank you, ma'am.

Mr. Moeller?

DR. MOELLER: Could I just ask, and I presume I know the answer, the staff is following up then on these control room HVAC questions about the changes in the tech specs and you are following up on the operability of the hydrogen analyzers?

MS. McKENNA: Yes.

DR. MOELLER: So we will get a report later on that?

MS. McKENNA: On the total ventillation, for instance, there was a technical specification change that was submitted and we are processing a licensing amendment which should be out very shortly which would explain the reasons for why they wanted the change and our evaluation of it and that will be available to you.

In the case of the hydrogen analyzer there had been some problems that were identified over the last year during some inspections and would have been on the R's and in response to inspection reports associated with that we have been following that issue very closely.

TVA has made some modificationsto the system to try to eliminate some of these problems, problems with water traps, for instance, in terms of instrument accuracy and we have been looking at that. I believe our intention is we were going to put out an evaluation of that system. I believe that is still in progress to close out these open issues that have resulted from the past reviews.

DR. MOELLER: Thank you.

MR. WYLIE: Mr. Chairman, we have one other item if we could take a minute or two to get a response on it. It had to do with the diesel generator sequencing.

CHAIRMAN KERR: You literally mean a minute or two?

MR. WYLIE: Well, I hope we can do it in a minute just to give us a report on the status.

MR. RICHARDSON: Mr. Moreno will give us the status on where we stand.

MR. MORENO: My name is Angelo Moreno, I'm the Chief of the Reactor Operations Branch in the TVA projects and I do have responsibility for resolution of of the diesel generator. Unfortunately, I have no slides. I wasn't certain about the interest of the committee on what the questions were with regard to calculations and the calculations do not lend themselves to a pretty slide.

So, I would be happy to answer any questions that the committee has. I will try to give you a quick overview of the recent past issues and events that have occurred.

CHAIRMAN KERR: Maybe we had better find out what questions the committee has. What questions does the subcommittee have, Mr. Wylie.

MR. WYLIE: Well, we looked into this when we were down at Sequoyah. So the subcommittee is familiar with the problem. I guess my only question is have we resolved the problem?

MR. MORENO: We have not resolved the problem. We met with TVA yesterday. TVA is in the process of attempting to resolve the questions that the staff has raised by using a different methodology than what was presented to us three weeks ago.

CHAIRMAN KERR: Is TVA confident that they can solve the problem?

MR. FOX: Yes, sir. They have some specific concerns which we have not addressed to their satisfaction. We are going to do a count with a different methodology to demonstrate the margins and hopefully that will help resolve the issue.

I think we agreed to the approach as to what we need to do to get the data that the staff requires to resolve the issue.

MR. WYLIE: We thank you, Mr. Moreno.

MR. WARD: Did we hear the office evaluation of the TVA meeting?

MR. WYLIE: Which one?

MR. WARD: The the fourth slide in the staff's package.

MR. WYLIE: Well, we cut several things short here because of lack of time. Do you want to take the time?

CHAIRMAN KERR: If Mr. Ward wants to hear it?

MR. WARD: Well, I thought the committee might be interested since that is a central issue.

MR. RICHARDSON: This is a brief summary of the various activities that the staff has done to review the management changes and satisfy ourselves that TVA Sequoyah is ready for operations in the near future and that the corporate changes are appropriate.

(Slide.)

Most of the changes that TVA has committed to from a corporate management or in the corporate performance plan, we provided a TVA evaluation on that last summer. Our overall assessment was that we had seen positive progress in all areas. We were satisfied with some of the specific changes that they had made. The staff has a continuing concern that the director of the office of nuclear power has too many people reporting to him. We went back and forth with TVA on several occasions.

The resolution of that item was that we approved the current organization with the stipulation that before new personnel are brought in specifically for the Office of Nuclear Power that we would have a 30 day notification prior to that change.

We have recently issued the SER on the Sequoyah performance plan. We have monitored the various aspects of the TVA management changes through our inspector program. We talked briefly about NSRB, the NMRG reviews. We conducted a two week inspection during late summer. It was an inspection team with people with human factors experience, resident inspectors from other sites who had good performing records.

We went through and essentially evaluated the different functional areas of the plant, ops, QA, maintenance, against the criteria of was management effective in planning the work. Did the communications within those organizations seem effective. And thirdly, was the work actually being accomplished and under the direct control of management.

The results of that inspection should be issued within the week. We have had some trouble getting the inspection report out but we are generally satisfied with the results the internal staff of OSP took the attributes that Dr. Merly wrote up which concerns staff training, whether or not the plant has a plant specific simulator, rigorous adherence to procedures, staffing, the amount of overtime, the nuclear work effort, professional decorum in the control room.

There were essentially 140 of those atttributes and we pulled together the various people. The resident inspectors, regional base inspectors, various managers at OSP and went down through these lists.

The one item that stood out back in mid December when we reviewed it was that we thought the nuclear work effort which was the safety consciousness whether safety was a paramount consideration, we thought that that needed improvement at that time and we told the commission that on January 20th.

Recently during the heatup process at Sequoyah Unit 2, we have seen some very positive improvements in that. The items that they got into where there was some uncertainty where there was an impact on the safety for mode 4 operations, the plant manager made a very early and decisive call that it was a safety issue and they weren't going to go forward until the issue was resolved.

Reportability was a problem. Back last summer they had several events and they were questionable whether they were reportable to the NRC. There was a change of correspondence. We have had reportability being much better and all the unusual events at Sequoyah have been promptly reported.

CHAIRMAN KERR: In your view is there a high correlation between early reporting and safety.

MR. RICHARDSON: Yes, sir, I think there is.

MR. WARD: Earlier we had a question about the qualifications of the NRC staff who are observing in the control room. I guess I'd like to ask a parallel question about the NRC staff who are making the reviews and the judgments here. Do you have staff members who have experience or training or education in the areas of concern at these meetings.

MR. RICHARDSON: We have several people on our staff who are routinely involved in the organizational approvals like in Chapter 13 of the FSAR, the routine approval of the licensees management structure and those type things and those people were involved in this review. The remaining people on the team were more operationally based senior resident inspectors from other plants.

MR. WARD: So the people who do the staff and the Chapter 13 reviews are experienced in that they have done other reviews?

MR. RICHARDSON: Yes, sir. I don't think, offhand, I can't think of any specific training or educational qualifications that have led to their qualifications for those things.

MR. WARD: Thank you.

CHAIRMAN KERR: Thank you, Mr. Richardson.

MR. WYLIE: I'd like to thank the staff and TVA for the presentations. Mr. Chairman, the subcommittee was favorably impressed with what it learned and saw at TVA in Sequoyah and recommends that we write a letter expressing the views of the ACRS in closing out our letter of August 12, 1986 and we have prepared a draft that will be recommended to the committee.

CHAIRMAN KERR: Okay.

One last question. As I understand in response to Mr. Ebersole, the concerns expressed by Mr. Bartlick, I believe it is, are being looked at and it will be resolved at some point satisfactory to the staff as to when startup occurs?

MR. RICHARDSON: Yes, sir.

CHAIRMAN KERR: And we will get a report on the resolution of that as soon as it is prepared?

MR. RICHARDSON: Yes, sir.

CHAIRMAN KERR: Other questions or comments?

(No response.)

CHAIRMAN KERR: Thank you very much. We will take a 10 minute break and resume at ten of.

(A brief recess was taken.)

CHAIRMAN KERR: We will continue an item we began yesterday and did not have time to complete.

MR. WARD: This time slot was originally item seven on the agenda. We have a couple of hours devoted to the discussion of the quantitative safety goals. We are going to postpone that for 40 or 45 minutes and pick up the staff discussion on key issues associated with advance reactor design at this time. I think we will go until about 11:30 with this topic and the subcommittee had reviewed sort of a working paper from the staff earlier and also had a presentation from the staff on the subject earlier.

The staff has made a number of revisions in their paper since then. We just got that revised paper yesterday so the subcommittee hasn't had a chance to look at it. But Mr. Tom King of the staff is going to present us a summary of that. I think it is a very important area and the committee is probably going to want to comment on it but I think not at this month's meeting. I think we will return to the subject at the meeting in March.

So, Tom King if you will tell us what you have to tell us.

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MR. KING: My name is Tom King. I'm the Branch Chief of the Advance Reactors Generic Issues Branch in the Division of Regulatory Applications. So I'm going to give a limited presentation and in consideration of time I'm not going to cover every one.

(Slide.)

I'm going to summarize what is on the draft paper that we gave to you a couple of days ago. So, I will skip some of the viewgraphs here. Let me just, by way of introduction, describe what we are doing here, what the purpose of this paper is.

(Slide.)

Yesterday you heard about three DOE sponsored, innovative designs, the HTGR and the two Sony reactors. Those designs, as you recall, proposed different methods of accomplishing their reactor safety function based upon the predicted plant characteristics of their designs.

The staff has been reviewing these conceptual designs for about a year now for the purpose of providing guidance on licensing criteria for these designs early in the design process. This is part of implementing the Commission's advanced reactor policy statement. As part of that review, we have identified four issues that we consider key issues that have policy implications that we have prepared a paper on to raise these to the Commission and the Commission has asked that these issues be raised to them for guidance before we issue our SER's and write an SER in each of the three areas.

So, the paper you have is in response to that Commission request. It is a staff proposal as to what criteria we feel are acceptable in order to accept the DOE proposals in those four areas.

The four areas are selection of accidents. How you select source terms, the containment question and the emergency planning question.

We had to brief the subcommittee on this. We would like an ACRS letter on this. The timing is up to you. We would like a letter on that proposal.

DR. MOELLER: Excuse me. One item in the last memo was the adequacy of offsite emergency planning. How could you determine the adequacy of the planning for an advanced plant that has not been built or sited? Do you mean what degree compared to today's plants what degree of emergency planning would be necessary?

MR. KING: As you recall, what is being proposed is essentially setting the EPZ at the site boundary?

DR. MOELLER: Right, with no necessity.

MR. KING: Other than maybe some notification kind of things there wouldn't be the initial drills and evacuation plan.

DR. MOELLER: So you wanted to review and see if that was acceptable.

MR. KING: Yes. We wanted to see what would it take in a design for us to be able to accept that.

DR. MOELLER: Okay, thank you.

(Slide.)

MR. KING: I will jump to page five and quickly you recall the advanced plants you heard about yesterday.

CHAIRMAN KERR: Excuse me, Mr. King. That statement implies that there would be some designs that would permit you to accept that.

MR. KING: Say that again, please?

CHAIRMAN KERR: There could be designs that would permit you to accept the fact that in effect the EPZ is, in effect, no emergency plan is necessary. I'm not trying to be critical. I want to make sure I understood the implication.

MR. KING: That is correct. We are sort of looking at things generically and finding out what would it take for the staff to meet that. Whether the designs will meet that will be discussed. We are discussing the approach in the four areas that this paper addresses. Just quickly recall what is being proposed on these advanced designs are a selection of accidents that need to be considered in the design, anticipated operational occurrences, design basis accidents and a range of LWR's we call them severe accidents or low probability accidents.

Each is proposing a set of those. Each designer is proposing a more mechanistic approach to siting source term selection and use. Each design does not have a traditional light water reactor type containment building and proposed something different. All three designs propose setting an EPZ at the site boundary. Those are the proposals that triggered--

MR. SHEWMON: A decade ago when you first heard about these things probably and maybe I did, there was talk about what I vaguely remember as a high energy dispersive accident which don't ask me where the heck it came from. All of a sudden you got a vent equivalent to how many other 100,000 jewels or whatever occurring and dispersing things. That was largely nonmechanistic too.

It seems to have disappeared from the scene. Can you tell me, in a few sentences basically, why we are more rational now?

MR. KING: Right. In the old days, particularly in the sodium plants there were HCDA's, hypothetically core disruptive accidents. FTAAA's were presumed to happen. In Clinch River, if you recall the licensing it became more of a mechanistic look, taking events in loss of decay heat removal events and taking a look at how the core would behaved and what kind of core energetics you would get out of that. So it wasn't quite so hypothetical.

Now you have designs that are taking great pains to prevent core melt and sodium boiling and prevent the conditions that would give you energetic events. We are taking the approach that there must be someplace out there where a plant can be designed safe enough that you can say those kinds of energetic events are so remote they don't have to be considered anymore.

MR. SHEWMON: These rather dispersed cores which we saw yesterday then are what result from this kind of consideration?

MR. KING: Yes. By using negative, inherent or passive reactivity feedback, decay heat removal features, reliability of those systems becomes higher. The reliability performing those safety functions becomes higher and the probability of core melt becomes lower.

CHAIRMAN KERR: Let me see if I understand what you are saying. You are saying that you will ignore the HCDA if you can demonstrate that core melt is extremely unlikely. That doesn't necessarily mean that if you got core melt that the HCDA would be positive. Is that a reasonable conclusion?

MR. KING: That is a reasonable conclusion.

DR. SHEWMON: What does the bottom of the pressure vessel look like when it is hot?

MR. KING: It is basically a hemispherical head. It is an all welded vessel, no penetrations.

MR. SHEWMON: But wasn't part of the argument that there was a sodium void coefficient back when they had a compact core and things of that sort and now presumably the sodium void coefficient has disappeared to something that would be subdivided?

CHAIRMAN KERR: Well, you can eliminate the sodium void coefficient.

DR. SHEWMON: So then, you have to talk about things melting and reassembling someplace else, is that it? And if this hasn't got a flat or dispersive bottom now but it could in principal then melt and collect down there, is that it?

CHAIRMAN KERR: Well, my question was aimed at-- My impression is that the HCDA, if you have a completely melted core, has not gone away. The argument is that the design must be such that the likelihood of a melted core is negligibly small.

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MR. KING: That is right. That is the thrust of what we are going to present. If you get into a core melt situation then you are back into the same concerns of the energetics and the melt through and the things that were on Clinch River.

DR. SHEWMON: This is melting a large part of the core?

MR. KING: You would have to melt a large part of the core to have energetics but I think once you start into a core melt, you are into a situation you don't understand very well.

What we have done in trying to address these issues we, started with the Commission's Advanced Reactor Policy Statement which had in there the only requirement or firm piece of guidance on level of safety was the statement in there that said these advanced reactors must, as a minimum, provide at least the same level of protection to the public and the environment that is required for current generation LWR's. However, the Commission expects advanced designs to provide enhanced margins of safety.

(Slide.)

So in developing the criteria that is the target or the goal we have been shooting for, current generation LWR's we have interpreted as meaning the advanced ABWR's that are under review now, things that will have to comply with the Commission's Severe Accident Policy Statement.

The approach we have taken is we have developed some general criteria to develop some broad safety requirements. The specific criteria to address each of the four key areas in more detail is a general or broad set of safety requirements. The criteria structured to define the minimum requirements to insure at least an equivalent level of safety and then to address enhanced safety as well.

What we used in deriving these criteria were policy statements that have been issued for LWR's particularly the severe accident policy, safety goal policy. You will hear about those, derived from those primarily. We tried to develop an independently developed criteria type. You have to allow for some design dependent considerations.

Our criteria was based upon technical considerations only, we didn't try to address public perception or any other external factor you may want to think of.

CHAIRMAN KERR: Mr. King, is your slide representative of your overall statement, it says minimum requirements are made to assure level of safety of LWR's. Which LWR's, as they are today?

MR. KING: The way we define current generation are the standard plants that are under review today, if evolutionary designs, the ABWR, APWR, SP 90.

CHAIRMAN KERR: It was my impression that one of the policy statements was that they thought the advanced LWR's should be safer than the current generation.

MR. KING: If you define current generation as the ones that are built and operating today, I think that is true.

CHAIRMAN KERR: Which group are you talking about?

MR. KING: We are comparing, using as a target, the standard plants that are under review today, the ones that will have to comply with the Commission's Severe Accident Policy Statement for future reactors.

CHAIRMAN KERR: So they are expected to be safer but we aren't quite sure how much?

MR. KING: Those are requirements under development, yes.

CHAIRMAN KERR: So they are expected to be at least an equivalent level of safety as the new LWR?

MR. KING: Correct, correct.

CHAIRMAN KERR: So since that is undefined, this is currently undefined?

MR. KING: Well, the requirements for future plants for severe accidents are under development.

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CHAIRMAN KERR: That is a better way of putting it than saying that they are undefined. I agree.

DR. MOELLER: Well, the next sentence if I am following, says the Commission expects to provide enhanced requirements.

DR. REMICK: Is that definition of adequate protection to be the break point where cost benefit can enter in?

MR. KING: Yes.

DR. SHEWMON: It seems to me that if you buy the premise that there is no way you can melt a significant fraction of a core that is credible then the rest of this follows that everything is sweet and wonderful. I didn't hear anything about nuclear reactor physics considerations yesterday and I just wondered if the subcommittee went over this or if that is a history that is old enough that all right thinking people already accept it.

MR. WARD: I think you did hear a good bit about reactor physics considerations for the two LMR's. It has based on that there has been a very considerable effort that is really centered around analytical experimental work at Argonne West, ABR 2 primarily. And with the metal core and really a bunch of complicated calculations which have been pretty well bench marked at least for ABR 2 that show some of the old concerns about LMR's have, there is an indication that they have been put to rest.

Now, how sure we can be about those conclusions for these bigger reactor designs is still an open question, I think.

DR. SHEWMON: Well, it seems to me what they have done at Argonne West is to show that the metal fuel goes through a reactivity or reaction temperature coefficient, has nice stable behavior or more stable than the oxide. The Argonne West people did not do the work on the core dispersion in the sense of distributing this with more space in between it but that was another part of Argonne.

And in a sense, I question not what happens if you take the control rods out and go drink a cup of coffee and come back in 20 minutes and see what happens which is certainly comforting. But the stuff on the core physics that leads to these distributions which I perhaps swept through but I really didn't hear yesterday--

CHAIRMAN KERR: I think you are right. I certainly didn't hear it yesterday either. I'm personally convinced that it is going to work but I didn't hear it yesterday.

DR. SHEWMON: That was my question that partly after hearing about this over several years we are convinced that it is essentially incredible that one could get a core dispersive accident?

CHAIRMAN KERR: Not yet. You can demonstrate that you don't have a positive coefficient. Whether you get a melt down is another question. That has to do with much more than the reactor physics.

DR. SHEWMON: Well, you can't do it by shutting off the pumps and you can't do it by pulling the control rods out and going away. That seems to have been demonstrated reasonably.

CHAIRMAN KERR: Well, if that is what the gentlemen stated as far as you are concerned, that is a key issue. You get rid of the positive coefficient. You get the fission heat and remove fission heat and remove the decay heat, there is no mechanism left for melt down that I can see.

DR. SHEWMON: If you get a decision on that, what we heard about that and who had heard enough to make themselves happy with it or satisfied at least, that was my question.

CHAIRMAN KERR: You mean the heat removal issue?

DR. SHEWMON: Yes, can you melt a core. Is there any credible way you can melt this.

DR. REMICK: Until you see a specific design, I don't think you can answer the questions on what is the chance of something coming in like a Fermi 1 until you see complete designs and put those things to rest.

DR. SHEWMON: So that is where we are. And with regard to the letter we would write on there, we think it is credible and promising but we don't know until we see a final design?

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MR. WARD: No. We as a committee aren't close to writing a letter. What is on the table for perhaps next month is not writing a letter on these designs. The staff is going to prepare an SER over the next year, several months anyway on each of the designs and we will be reviewing that and have as much time as we think is necessary to make whatever comment we would want to.

Before that is done, the Commission has asked the staff to prepare in advance of review of those three particular designs, he wants the staff to prepare kind of a position paper on these four particular issues which they think are sort of generic as far as all the designs and to lay out in advance what the staff's position is going to be on those issues. That is what we are reviewing today and will be reviewing further next week.

It is sort of an abstraction, almost, except that it helps to have the three designs in mind to kind of make some sense out of it.

DR. SHEWMON: It is a little bit difficult to correct the source term or an accident selection in the absence of what I was asking about. Maybe I just don't have a broad enough picture.

MR. WARD: Well maybe, if you have got a concern about that, maybe thi_ is an impossible task.

MR. MILLUNZI: Well, if I could interrupt, I guess I would take issue with that.

CHAIRMAN KERR: You can't interrupt.

DR. SHEWMON: Well, you say you can do it in terms of probabilities instead of mechanisms.

CHAIRMAN KERR: Mr. King, you may continue.

MR. KING: We are really talking about an approach and a set of acceptance criteria that we would bounce each of these three designs off of in these four areas. We are not approving the designs. We're not asking for a letter on the designs. We are asking for what are your thoughts on the staff approach and acceptance criteria that they would use to evaluate these four areas.

MR. EBERSOLE: These liquid metal reactors shut themselves down if you have a general heating of them for whatever reason. But what we used to call the felt hat syndrome where you have a partial blockage. I don't think that shut down would occur if you had a partial blockage of a few channels would it?

MR. KING: I don't think it would either.

MR. EBERSOLE: So that might be the basis for starting to develop some phenomena.

MR. KING: You have to be sure it wouldn't happen to a significant degree.

MR. EBLRSOLE: That would be an unbelievable earthquake would close the plant all over the place would be the only thing I could see. I can't find anything else.

CHAIRMAN KERR: Why don't we continue.

MR. KING: I want to be sure there wasn't one misconception. These designs have not eliminated positive sodium void coefficients. They have greatly reduced the possibility that you would get into a situation where the sodium void would occur and if it would occur it would cause you a problem.

CHAIRMAN KERR: But you can eliminate a positive coefficient if you choose the appropriate core design.

MR. KING: You can eliminate it by core design. We have talked about that a little bit with the designers. I think it would be quite a penalty in other areas to do that. But it can be done.

(Slide.)

Given that approach we have talked about a general criteria defines sort of a broad framework for reviewing these designs. I said there were two sets, one to design an equivalent level of safety or adequate protection which I will talk about first and then the ones that deal with enhanced safety.

Under adequate protection, the first one is we want to insure these designs comply with existing rules and regs as interpreted for the advanced reactor concepts. There will be three major exceptions and those are in the area of source term, something different than the LWR and TID 1484 approach that has been proposed. Containment function may be different in the need for a conventional containment building is being looked at and then emergency planning could be modified to reflect plant safety characteristics.

The other regulations would be very similar to what was done on Clinch River. A lot of the GDC's for LWR's applied to Clinch River with some minor modification. That same kind of process would be done on these plants. But I think the three major areas that would be different would be the three listed here.

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DR. REMICK: Let me ask you a question there. The question of staffing and I realize that can easily change with time, where does that fall. Would that fall under your statement that complied with existing rules and regulations as interpreted or should they be listed as one of your bullets.

It is obvious from the presentation people are taking some innovative staffing of these and maybe that is possible. I want to keep an open mind about it but it seems to me that what is presented a couple of cases is inconsistent. Can the staff interpret this.

MR. KING: You are saying maybe there should be some other bullets listed on here?

DR. REMICK: My question is has that thought been given to that and that is included in the words as interpreted to see if that would require a waiver. Do you have staffing requirements in Part 50 specifying the table 5034 or what. Would that be included in your words as interpreted?

MR. KING: That is included in the words as interpreted.

DR. REMICK: There would be a waiver to that requirement and you would have to ask for exception or waiver to that specific proscriptive requirement?

MR. KING: Unless that requirement is

specifically directed toward LWR's and I haven't read that in a long time. I'm not sure.

DR. REMICK: You might then say that for advanced reactors you have another table?

MR. KING: Possibly, yes. We thought these were the three major areas that certainly had some policy implications that we couldn't do at the staff level.

DR. REMICK: I guess in my mind that is as important as your last four numbers in planning. It should be modified to reflect plant safety characteristics. The plant staffing should be modified to reflect plant safety characteristics also. I guess I'm not quite sure why it is not a bullet.

MR. KING: I guess I didn't view it as a policy question at this point in time, plant staffing.

DR. REMICK: Let me just pursue that a little bit. While the staffing was a policy issue based on a staff recommendation it seems to me emergency planning is a policy decision also but change in staffing for advanced reactors would certainly be a policy decision.

MR. KING: We certainly plan to address that. We didn't feel it was of the magnitude of the three listed there and that is why it is not in this paper. It would be in the RCR's certainly. Maybe we were wrong in making that judgment.

CHAIRMAN KERR: It may be covered in the language here but it seems to me that since the source term of LWR's means something released in the containment as it is used at least in the 400, since these plants don't have containment in that sense, what does one mean by a source term?

MR. KING: There is going to be a separate slide on source term. Maybe we can talk about it when we get there.

CHAIRMAN KERR: All right.

MR. KING: The bottom item on this slide is the second criteria which says these advanced plants must comply with the intent of the severe accident requirements which are presently being formulated for LWR's. That is to meet the same procedural criteria given in the severe accident policy which is basically to do a PRA, consider the USI's and GSI's for a capability to design and have the staff review the design and have a successful outcome.

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They will have to identify a range of severe events that have to be considered in the design. We need to evaluate the design features incorporated in the design to prevent severe accidents to be sure that anything that is not considered in the design is a good reason for excluding it.

MR. EBERSOLE: Is it a sort of given that you have to horse around until you find a substantial release, a source term no matter how you do it?

MR. KING: For these designs?

MR. EBERSOLE: Yes, as a matter of fact it was done even in the--

CHAIRMAN KERR: Mr. Ebersole, he said he had a slide on the source terms.

MR. EBERSOLE: You are going to get to the source terms. I recall that that the worst source term in an old boiler was when you dropped a source stick. It wasn't a large local. You looked around until you found one that produced a pretty juicey answer.

MR. KING: Well, the intent here is to do that, to find a range of accidents that you have to look at and then whatever the worse one in terms of release is, that would be used for siting. That is the summary of what we are proposing.

MR. EBERSOLE: Okay.

MR. KING: The last item under the severe accident policy compliance is the staff needs to evaluate the design features provided for mitigation and accident management to insure that we have confidence that they will work and anything that deals with procedures or training are, in fact, incorporated in the procedures and training.

The third item is the criteria need to require fission product retention capability at least equivalent to LWR's. And what we mean by that is for equivalent classes of events, criteria for fission product release should be the same as for LWR's. We will get to that when we get to the source term slide.

We want to maintain the defense in department concept. However we realize that in its application you need to give consideration to the safety characteristics of advanced plants. They do things differently. I've got a slide and we will talk a little bit more about defense in depth on another slide.

Under defense in depth there are three things we want to make sure are maintained and that is that we have two diverse independent means of reactor shut down and two diverse independent means of decay heat removal and multiple barriers to fission product release. We are not willing to put all our eggs in one basket on either of those.

Next, because these are new designs, got reduced operating experience as compared to LWR's, to make sure where they use new innovative procedures for safety functions that they indicate their testing of these new features to prevent or accommodate accidents.

(Slide.)

Testing could be done a number of ways. The specifics of the testing will have to be figured out on a case by case basis but we feel that generally they need to include some testing on a full size reactor module to demonstrate that these features work.

Along with that, because our new innovative features we feel need to be looked at very carefully, the need for enhanced QA's, surveillance and testing are necessary. To insure that these features perform in the plant what they are supposed to do.

For example the HTGR fuel is the key to the safety position on that plant, that it be of high quality, that its performance be monitored in the reactor. We may want to do something different in terms of QA requirements on the fuel, what we would monitor in terms of fuel fabrication or something different to be more stringent than what we do on LWR's.

CHAIRMAN KERR: It seems to me it is a slight oversimplification to say that the fuel is the key to performance of that plant. The fuel is the key to performance of that plant only if the fuel doesn't get hot. So it is not just the fuel. It is the fuel plus the absence of heat storage capacity of the core plus

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the capability to remove decay heat.

MR. KING: You are right. That was an over simplification. It is the combination of heat removal and power generation and fuel performance. I just used that as an example. You can consider the reactivity feedbacks on ALMARS. You want to make sure, as the lifetime of the plant progresses and you get swelling of the material and creep and distortions, that you still have those feedbacks that you need to shut the plant down. That kind of thing you are talking about being covered by this.

MR. WYLIE: What is enhanced QA?

MR. KING: That would be like using the MHTGR fuel as an example. NRC may want to do something different in terms of what it requires of the applicant in terms of quality assurance to make sure you have to fuel quality and also what it does to oversee or independently verify that that fuel quality is as advertised?

MR. WYLIE: Or QC?

MR. KING: QC, if that is a better way to say it.

CHAIRMAN KERR: Do you now understand what enhanced QA is?

MR. WYLIE: Not really. What I think I heard was more quality control.

MR. KING: Maybe QC would have been a better term.

DR. SHEWMON: I'm interested as to whether it means more paper or more quality.

MR. KING: The intent is more quality. Maybe that takes more paper, I don't know. The intent is to be sure that you get the quality that is needed for these plants is actually coming out and being put into the plant.

DR. REMICK: Before you move on, at the very top of the page I'm trying to understand what it says. Specifics of plant testing can be determined on a case by case basis but generally should include some testing on a full size reactor module. Now, I assume, and I think I understand but does that say that in most cases there should be a prototype or does that say--

MR. KING: What it is intended to say is either the prototype or the first of a kind plant could be built for being put on a grid. But the first of a kind ought to be used to demonstrate that these features actually do the things they are advertised to do.

DR. REMICK: But it does not necessarily mean to indicate that a prototype is required?

MR. KING: It does not mean you have to build a dedicated prototype out in a desert someplace.

DR. REMICK: That would have to be determined on a case by case bases whether it is a prototype or whether it is the first one and the type of testing you have to do.

MR. KING: Generally our feeling is it could be a dedicated prototype or the first commercial unit and what will be figured out on a case by case basis is the specific tests you want to run. Those may vary depending on the plant.

(Slide.)

The second general item was dealing with requirements associated with enhanced safety. The Advanced Reactor Policy Statement had in there that the plants are expected to have enhanced marginal safety. We feel the applicant should assess and document this enhanced safety characteristics. For example, the kinds of things we are talking about are the long response times on accidents, the reduced potential for operator error, capability to retain fission products, simplified systems and so on.

They should also look at potential improvements when there is a small margin between the enhanced safety and what is the minimum required or when large improvements in safety can be realized as a reasonable cost.

CHAIRMAN KERR: What does long response time mean?

MR. KING: Long core heat up times before you get into any release. Long time periods before you have any release of radioactive material.

DR. MOELLER: Why does it say in the big paragraph near the bottom, potential improvements? Why not just improvements in safety are to be considered?

MR. KING: It could have been. That is probably a good suggestion. What we had in mind is that there would be some things when we do the review that we will think of, why don't ,u consider this or consider that and we will get them to do it, consider it at least and then pick those on a judgment basis and make a decision on a judgment basis should they be in the design or not.

Again, the testing would demonstrate these enhanced safety features as characteristics or margin as well as demonstrating the minimum required.

MR. WARD: So the time for the item Dr. Moeller is asking about is explicitly cost benefit analysis going to be a key consideration there?

MR. KING: Yes. For those enhanced things, cost benefit would be the main consideration.

DR. MOELLER: Dr. Kerr, the bottom bullet answers your earlier question. They are going to demonstrate enhanced safety through testing. You were asking earlier how TVA could determine whether the safety had been enhanced. Apparently they can do it by testing.

MR. EBERSOLE: Let me ask you a question. You have got a baseline performance in the water reactors we have, the PWR's and BWR's. It is kind of a baseline you say these plants should be equal to or better than that. What are you going to do about the fact that out of these plants X through Z or whatever, some of them could be a hell of a lot more safe than others. Would you permit them to wonder randomly in that safety field or would you exact upon them the requirement that they do as well as they can in a practical sense or kind of an optimum enforcement? Do you follow me?

MR. KING: Yes, I think I follow you.

MR. EBERSOLE: We have got a high ceiling like the water reactors if you want to call them not nearly as safe as these might be. Nevertheless these can be just as, shall I use the word, unsafe as water reactors and there is no means my which you could prevent that. What are you going to use as a lever other than just maybe the attractiveness of the plants to the commercial seen to make them do as well as they can?

MR. KING: Well, I think part of that enhanced safety we talked about is to try and make them do better where it is cost beneficial to do so. I think the baseline requirements that they have to complete won't vary from advanced plant to advanced plant. If it is Part 100 guidelines that will be what it is. If some are well below Part 100 more so than others, we wouldn't say because this guy is way down here, everybody has to be way down here.

MR. EBERSOLE: No, you wouldn't do that but you might push on him to stay there rather than loosen up and make it cheaper.

MR. KING: If a plant gets a license based upon certain safety analyses and saying he can do certain things, for him to come in and change the operation and design where that is now going to be different, that is the kind of thing that NRC would review as part of whether it is a 5059 change or tech spec change or something like that, we would have to agree to that change.

I don't see us just walking away and letting everybody go make changes after it is licensed. We still have the normal tech spec changes and 5059 type changes that take place.

MR. EBERSOLE: Based on the unique safety level his plant is in rather than a common level which includes the worst plan.

MR. KING: The SAR and tech specs under which he was licensed, that reflect the level of safety which he was licensed at. Maybe he could make changes that would raise something up in a less safe direction. Maybe he is so far down there anyway it doesn't make much difference. There has got to be some flexibility.

MR. EBERSOLE: Yes.

(Slide.)

MR. KING: Now, let's talk a little bit about defense in depth. Part of our material is to maintain defense in depth and in looking at this we considered defense in depth to fall in four major categories. Things that are there to prevent accidents, protect things that are there to protect the plant when accidents do occur, things that are there for mitigation purposes, mitigate radiation, mitigate the accident and then emergency planning.

Basically, when we say we want to maintain defense in depth, we want to provide features in all four of those categories, not throwing away any of those categories. The prevention area, the requirements that we were looking at and what the designers were proposing are essentially to provide equivalent level of LWR's.

In other words, they are designing vessels to ASME sections, QA programs consistent with NRC Regulations and 10 CFR Part 73, secure safeguards and security. All the things that you would normally do to have a high quality system, high reliability system for the requirements on LWR's would be on these plants.

When you look at protection and mitigation I think that is where you see some differences. There tends to be a shift of advanced reactors putting a lot of emphasis on the protection of the plant, keeping the core in a condition where the fission products aren't released.

CHAIRMAN KERR: Mr. King, as one thinks about this the implication, I believe, is that one can eliminate events to the containment because of the increased reliability that is built into the advanced reactors or might be built into them particularly removal of decay heat. That might convince one of the need to remove decay heat from existing reactors is not very reliable.

However, if you look at what has happened, the one serious accident in this country didn't arise because of the capability for removal of decay heat was unreliable, it was because the people didn't understand what was going on.

MR. KING: That is correct.

CHAIRMAN KERR: So is one of the features of advanced reactors going to be that the operators understand them much better than the operators understood LWR?

MR. KING: I think one of the features of advanced reactors is trying to eliminate one of the things the operator has to do to make sure safety functions are performed, two the things that he can do either inadvertently or on purpose to turn off those safety functions, and that is right in here "minimize the need for human intervention". That is an important feature in the protection of these plants.

Along with response time if something goes wrong, the guys have time to think about it. But they are not systems that he had to turn on or turn off. They are features in these plants that he can't turn on or turn off. They are always there. I think it is that kind of consideration that has to go into looking at it.

CHAIRMAN KERR: You don't think it would be plausible to make a plant idiot proof?

MR. KING: I think it is plausible to make a plant very, very independent of what the operator does. I wouldn't say if you turned five idiots loose in the plant they couldn't find something at some time to mess it up but that is not the criteria we are using here.

MR. WARD: I think there is a point here Tom, if this were aimed to be an LWR design that had, let's say, an independent backup SCRAM system that had some sort of improved or perhaps qualitatively approved AE rule for passive and had maybe some more favorable inherent response characteristics to upsets and present LWR's, then by these criteria we might say that LWR wouldn't be the containment.

MR. KING: These criteria as presented, you could bounce any advanced reactor off of them, whether it is an LWR or anything else. So it is not inconceivable that some innovative LWR's aren't designed to come along and meet these criteria. Then you could meet the same criteria that eventually you don't need the same containment.

MR. EBERSOLE: Does a containment cease to be a containment simply because you transfer heat through its walls as a means of heat rejection. I don't think it does. Do the two sodium reactors not have containments?

MR. KING: Yes, they have a containment barrier. When I say containment they don't have a conventional LWR containment building. They have a third barrier outside.

MR. EBERSOLE: The additional duty put on it is that it conveys heat directly to the outside whereas the others use changers. I didn't regard that as a sufficient perturbation to its concept to not call it a containment?

MR. KING: I don't either. It is a containment barrier. It is not a conventional containment building.

MR. EBERSOLE: Sure.

MR. KING: The point I wanted to make with this slide was I put some asterisks on where advanced reactors have more emphasis in looking at the various components in defense in depth versus LWR's.

Primarily, you look in this column, that is where the advanced reactors are concentrating a lot of their effort, prevention of access. They still have mitigation in terms of long response times, physical phenomena that hold up or cause fission products to plate out and emergency planning. Basically, what is being done is you are saying you have got such a long response time out there that if you did have some accident that would cause you to exceed the protective action guidelines at the site, that you would basically substitute ad hoc evaluation for preplanned evacuation. That is the way we are looking at it.

MR. WARD: Have you been able to visualize any sort of accidents that might require evacuation?

MR. KING: Sure, if you push these designs hard enough, put enough if's on the accident scenario you can get releases that will cause evacuation. It isn't that these designs just eliminate it totally. It is more a question of how low a probability or how unlikely are those kinds of events given the safety characteristics of these plants.

Sure, if you get into a core melt on one of these LMR's and it goes through the vessel and a guard vessel, sure, you will have to evacuate.

DR. SHEWMON: How do you get into the core melt under the LMR's?

MR. KING: You put a hole in the reactor vessel and the guard vessel around it, both vessels and drain all the sodium.

MR. WARD: Not only that but then you have a natural convection pump that is pumping it up into the atmosphere, the passive decay heat removal system, the aerosols.

DR. MOELLER: I understood the double asterisk but I'm not sure I understood the single. The ad hoc evacuation would be utilized more in the advanced reactor than in the current LWR. Why is it ad hoc evacuation?

MR. KING: If you had to evacuate, it would be on an ad hoc basis.

DR. MOELLER: So it would be more applicable in this?

MR. KING: More applicable, yes. And now I will talk about the four specific areas that this was leading up to.

(Slide.)

First, accident selection. What we have done is define four event categories that the plants need to consider. We have used different terms before and there has been a lot of confusion beyond design basis accidents and things like that. So we are now calling them event categories. Basically, the first one is anticipated accidents. They would include accidents that are expected to occur one or more times during the life of the plant and they would be treated the same way as they are in CFR 190.

The second event category would be equivalent to postulated accidents, the term as it i' used in Appendix 8 of Part 50 called the design basis accidents. The engineering judgment would be complimented by PRO to generally include accidents down to about 10 in the last 4 years.

It would be analyzed in a conservative fashion like DBA's are for LWR's and you would have traditional ones in terms of external events. There wouldn't be any difference there in the way DBA's are selected and LWR's or the way they work.

The third category which are the severe accidents or the more remote accidents that need to be considered in the design. And what we are proposing there is selecting a range of accidents beyond the EC2 or the traditional DBA's that are considered consistant with the Commission Severe Accident and Safety Policies in consideration with PRA results.

Generally, where they would fall would be events with a frequency down to approximately 10 to the minus 7 per year.

(Slide.)

External events would be included in this consistent with how we intend to apply them on LWR's. Then we would have in that group, in the EC3 group what we call a set of bounding events which cause our uncertainties in doing PRA's and trying to identify what accidents should fall in this category would be an engineering judgment, select some accidents and put in the EC3 category. We feel it bound the uncertainties that came out of the PRA. There are a couple of slides that talk about those.

DR. REMICK: How did you arrive at the 10 to the minus 7th on internal events?

MR. KING: This basically comes to the 10 to the minus 6 guidelines as a commission safety goal to insure that you comply with that in terms of a large release, we felt we ought to go down to at least 10 to the minus 7th. So when you look at events down there, the cumulative frequency of those would beat the intent of the 10 to the minus 6th number that seems to go with it. That is how we ended up with it.

DR. REMICK: So basically, any individual sequence might be 10 to the minus 6th is that it? Is that how you arrived at it.

MR. KING: Any individual sequence that would go down to 10 to the minus 7th would be considered in that category.

DR. REMICK: Yes, one tenth of 10 to the minus 6th.

MR. KING: That is right.

CHAIRMAN KERR: I guess there is a good bit of logic in this. There is something a little bit artificial in that if these things were anything like LWR's you don't really get any significant release unless you have a core damaging accident.

Now, the original DBA's were set up on the basis that you could ignore core damaging accidents except in the design of the containment. But otherwise you would assume that if you satisfied the criteria, everything would work, that is everything would prevent core damage. And it looks as if in dealing with events in category one and two, that is what you are going to assume in dealing with these.

You are not going to talk about reliability of equipment other than that which satisfies the same trade criteria. Them at some point, and maybe it is in category three although it is not clear, if a break occurs dealing with severe accidents you are going to shift to a PRA approach or a liability approach. There is something about that that strikes me as being different.

MR. KING: Well, when you get into a third category, events that have multiple failures are going to come into play.

CHAIRMAN KERR: Well, if they are going to come into play there, why shouldn't they come into play in the beginning. If you are going to take these events into account with the PRA, why shouldn't the PRA be the basis for the planned analysis. You can certainly predict events with higher probabilities.

If they are going to do the PRA, it seems to me one ought to use the information which we all recognize is the criteria that is somewhat artificial and doesn't give you a uniform level of reliability.

MR. KING: I don't think their is any intent to ignore the PRA in the first two categories?

CHAIRMAN KERR: You may not ignore it but apparently you aren't going to use it. You use the conventional DBA approach because the DBA is said to be mitigated in the conventional approach. The safety system satisfies the same failure criteria independent of what their reliability is.

MR. KING: If you recall back in the second category, it says that reselected via engineering judgment complimented by the PRA. If the PRA is within this frequency range it has to be considered a DBA.

CHAIRMAN KERR: The design basis accident business doesn't make a lot of sense but I don't trust my judgment to take that too seriously.

MR. KING: The intent is if you look at the PRA there should be some events in this frequency range that would be considered DBA's. But then the traditional approach seems to go beyond that and includes events, DBA events that maybe wouldn't fall within that frequency range like a large tornado that is a DBA tornado.

CHAIRMAN KERR: I'm sort of saying if you are going to do a complete PRA it is not obvious to me that it makes a lot of since to worry about DBA's. But you thought about that and you are convinced that it does.

MR. KING: I'm trying to show some equivalency with LWR's which has that grouping and has certain release limits on that grouping.

CHAIRMAN KERR: We are already in a very difficult situation with LWR's and we are trying to make a marriage with DBA's and PRA's. The liability analysis that comes out of the PRA from the beginning-- Maybe not.

MR. KING: If you find it tough to compare to LWR's in terms of demonstrating safety if you do that.

MR. WARD: Wait a minute. The main problem is that a designer needs a DBA to design for.

CHAIRMAN KERR: Well, he certainly needs a DBA if he is going to use the DBA approach.

MR. WARD: How does the designer design?

CHAIRMAN KERR: He does not now have to talk about the probability of an accident. It is assumed that if the single failure criteria is satisfied an accident won't occur in the DBA part of their program.

Now, once you get into the serious accident part you are now willing to talk about multiple failures and reanalyze a system which has just been designed so that it meets a single failure criteria. And I don't know what you do if the single failure criteria isn't good enough. I guess you obviously can't use it.

DR. SIESS: You can't design for a PRA except by a highly reiterated process?

CHAIRMAN KERR: You can conclude that certain systems ought to have a reliability and your reliability isn't all that great.

DR. SIESS: That is an analysis. You have to design it first and then analyze it. Even if the NRC isn't involved.

MR. WARD: I promised Mr. King that he could leave by 11:30.

MR. KING: We can take a few more minutes and finish up.

The third category of events, the best estimate analysis, would be acceptable for those. The fourth category of events is an attempt to look at the same range of events for emergency planning as was looked at in new reg 0396 for LWR's to choose to look at events down to 10 to the minus 9th, frequency of 10 to the minus 9th in doing that.

DR. REMICK: Internal or external or both?

MR. KING: Those would be internal events.

DR. REMICK: Internal events down to 10 to the minus 9th.

DR. SIESS: Its better than external events down to 10 to the minus 9th.

MR. KING: If you look at the curves in new reg 0396 that is what they went down to.

CHAIRMAN KERR: I wish you wouldn't put number 4 on there. It makes the rest of it much less believable.

MR. KING: You have to see how we use it first.

DR. REMICK: Is that where the PRA came out?

MR. KING: You get those events from the PRA.

MR. WARD: I guess I see category 4 as take the number out and say despite all this, there is some judgment deterministic criteria we are going to lay out and this is where we do it. And I think that is really what you are doing.

MR. KING: The judgment events are right in this category here which are in the third category.

DR. SIESS: What does that leave you for four then?

MR. WARD: You are associating the numbers too.

MR. EBERSOLE: You said that is for internal. What if you include external?

MR. KING: In category four, you would have a tough time figuring out what it is.

MR. EBERSOLE: That would include media strikes, I guess.

MR. KING: It would include the continents moving all around the world.

MR. WARD: I would ask you, the HTGR folks had a rather well developed methodology or strategy for picking TVA's and I haven't had a chance to see how that compares with what you are doing here. But have you compared it?

MR. KING: Yes. Essentially what they have done, the first two event categories are essentially the same. They have three categories. Their third category looks at accidents with five times 10 to the minus 7th frequency. They look at everything down to there and they look beyond that to see if some uncertainty would cause something to fall up in there. But anything that falls in that range they would consider in the design in terms of making sure they don't exceed the protective action guidelines at the site boundary.

They use it for emergency planning purposes. It may also require design changes to make sure they beat that. So essentially, they have got a 5 times 10 to the minus 7th as the third category and we have got 10 to the minus 7th.

DR. REMICK: But you have gone one category beyond?

MR. KING: Yes, we have one category beyond but you will see how it is used.

DR. REMICK: Isn't there some risk in going down to 10 to the minus 9th that unintentionally concerning the public about events that are so improbable and you just raise public concern about things, what if, what if, what if, what if, I would think?

MR. KING: It may raise a concern. I'm not sure but LWR's looked at the full range of accidents when they looked at what their emergency planning needs were. We are trying to attempt to look at that same range. That is part of trying to show some equivalency with LWR's in terms of equivalent safety.

MR. EBERSOLE: Do the French and the English and the German's and the Japanese do this sort of thing?

MR. KING: I'm not sure what they do.

MR. EBERSOLE: I'm thinking of this as being maybe a deterrent to the recovery of the option.

MR. KING: I can't answer what they do.

(Slide.)

Just quickly I mentioned that third category had things we called the bounding events. Those were selected by engineering judgments to bound the uncertainties and we basically try to pick a bounding strength and cover the uncertainties in the six key areas. Reactivity insertion, decay heat removal, chemical reactions, loss of coolant inventory or flow, loss of supporting systems, external events.

Key considerations we have that we factor in in selecting those are we assume the nonsafety grade equipment fails in the worst way. We assume safety grade equipment fails for a period of time consistent with previous experience on reasonable recovery time. And we consider what the human errors can do, consistent with previous experience.

The bounding events would be included in the staff SER. Generally so far, just a generic list of the kinds of things that would fall in that category.

(Slide.)

DR. SIESS: Is that distinction between safety grade and nonsafety grade based upon anything other than-- PRA's don't make any distinction between safety grade and nonsafety grade reliability.

MR. KING: Our approach in that regard is these designs are trying to concentrate all the safety functions in the nuclear island. Anything outside that balance of plant, control room doesn't have a safety function anymore. So what we are doing shouldn't be regulated by NRC. So what I mean by that statement is that if it doesn't matter what happens out there well then prove it. Let's take the worst event that can happen out there and show your plant can ride through it. That is essentially what I mean.

DR. SIESS: I understand.

MR. KING: Just quickly some generic type events that would be on the bounding list would be like inadvertent withdrawal of all control rods for a certain number of hours. Loss of all decay heat removal for a certain number of hours.

Steam generator tube ruptures. Loss of flow or pipe rupture, primary pump seizures, station black out and external events consistent with severe external events we have imposed on LWR's. Second would be the issue of the source term.

(Slide.)

You will recall what was being proposed was using a more mechanistic analysis to calculate the release at the plants. What we are proposing is for stating purposes, using events categories two and three and that you would look at the events in each of those categories and do mechanistic analysis, calculate what the release is into the environment.

For event category two they would have to meet 10 percent of 10 CFR 100 guidelines. For category three they would have to meet 10 CFR 100 guidelines. If you look at the standard review for LWR's there are a number of chapter 15 accidents that allow a mechanistic calculation in source term. When they do that they generally put a requirement in there that says the release has to be a small fraction of Part 100 which it generally interpreted as 10 to 25 percent of Part 100.

We are taking that same approach and saying 10 percent of Part 100 will be the release if we're going to use a mechanistic source term that will be the release for those.

CHAIRMAN KERR: Mr. King, one might use 100, is that the case?

MR. KING: Yes.

CHAIRMAN KERR: Well, I thought that there was underway before TMI 2 an effort to revise 10 CFR. So let's put it on hold. Does the staff conclude that 10 CFR 100 is okay and doesn't need revision or is this referring to a revised 10 CFR 100?

MR. KING: No, this does not refer to a revised 10 CFR 100. This would be the same dose guidelines that are in the existing Part 100. I don't know of an effort to revise Part 100.

CHAIRMAN KERR: It certainly was underway, an effort to revise 10 CFR 100:

MR. MORRISON: Bill Morrison, NRC staff. You are right, there was a plan at one time to revise Part 100. At this time there is no specific action plan to do that revision. However, we are evaluating what revisions to the regulations might be warranted in order to put ourselves in a position to license the new standard so we will be putting together a strategy to get that set of regulations in place.

Right now that is a concept. There are a set of advanced designs that we would envision some day perhaps in addition to these in the certification process.

DR. SIESS: I didn't know whether you were referring to the branch reactors or the next plant? Mrs. Morrison, we think the next plant would be a so-called advanced plant and a standardized plant.

MR. KING: The only other thing we would suggest in citing is we want to make sure anything in the second and third category are not sitting on a threshold where some small change would cause a large change in the sources you get it from.

(Slide.)

The third issue is the question of containment.

We have put together a set of criteria that if a plant could meet them without a conventional LWR type containment building proposing that acceptable criteria that there are multiple barriers to radiation that there are categories 1, 2, 3 that we talked about earlier to demonstrate the same testing we talked about earlier that the above releases are achievable.

That additional or enhanced QA surveillance, inspection or testing as necessary is in place to ensure that those new innovative systems, structures and components contribute to performing the containment function and are, in fact, capable of performing the function. That would include the decay heat removal as well as fuel quality and reactivity shut down.

The design provides protection for safety related systems, structures and components and sabotage and external events equivalent to that for LWR's. It would have to meet 10 CFR Part 73 for security. It would have to show that turbine missiles and other external events, the plant is protected from them.

And that they eliminate core melts, significant causative reactivity feedback or other accidents with the potential of a large radiation release from the three categories. You have to go through and evaluate the design and make sure you can satisfy yourself that those kind of accidents beyond 10 to the minus 7th can be excluded from consideration in the design.

DR. REMICK: Isn't that inconsistent? To me as I read those words that you just said, the probably should be less than 10 to the minus 7th, isn't that then inconsistent with the Commission statement of 10 to the minus 6 th on major release. You just put in a factor of 10 on what is in the safety goal. You said it must be below 10 to the minus 7th now.

MR. KING: Yes, we said individual events you need to look down to 10 to the minus 7th and consider those in the design. What we are saying here is when you look at those individual events down to 10 to the minus 7th, none of them can have major consequences like a core melt, graphite fire or whatever.

DR. REMICK: So this is not addressing the accumulation of those. It is the individual.

MR. KING: It is addressing them individually.

CHAIRMAN KERR: If a light water reactor can also demonstrate this same degree of lack of release that you consider licensing of the water plant?

MR. KING: If a light water reactor defines the three event categories including the bounding events that you would include in that event category to meet these criteria, then what we are saying is we would consider licensing.

CHAIRMAN KERR: You would be willing to put enough fate and reliability in PRA to license a water reactor?

MR. KING: It may be a tough job to show you have got that reliability or that you can survive some of these bounding events that you rely on. But if the staff can be convinced that all of that was true, yes, you would. We would entertain licensing them without a conventional container.

These would have to be innovative designs that fall outside the current standard review plan type requirements.

CHAIRMAN KERR: The designs being designs with which there is no experience, and other things being equal I would expect to build a particular behavior that might have more uncertain than would be the case with a water reactor with which we have had a lot of experience. It doesn't necessarily follow our expectations.

MR. WARD: I think the reporter is having trouble hearing you. Jesse pointed that out.

CHAIRMAN KERR: Thank you, Mr. Ward.

MR. KING: The other item is the enhanced safety question. We are designs without a conventional containment building an assessment of the potential improvement in safety of adding one and then with cost considerations decide whether we would still accept it without one.

(Slide.)

The last area is the emergency planning area. The proposal was to set the EPZ at the site boundary or proposing two criteria would have to be met in order for us to accept that one. First they would have to demonstrate that the lower level protective action guidelines are not exceeded at the site boundary during the first 36 hours following any event in the first three event categories.

You have to explain that 36 hours comes from looking at ad hoc evacuations, the history of ad hoc evacuations would show generally within two to eight hours, you can move a large population of people. We have selected 36 hours on the basis that we will conservatively say we want 24 hours to move people and 12 hours for the plant staff to diagnose and correct the event before they go ahead with the evacuation.

We feel that all the events in that category show that you have a long time before you would have releases that exceed the PAG's and we would be willing to set the EPZ at the site boundary and then any off site evacuation, if it was needed, would be conducted on an ad hoc basis.

The second criteria says that looking at the PRA looking at the events down through category event 4 which is the same range we looked at for LWR's, we want to show that cumulative frequency of exceeding the lower level protective action guidelines at the site boundary within the first 36 hours does not exceed 10 to the minus 6th per year. That is an attempt to look at the residual risks beyond those events in the first three categories to make sure you don't have a bunch of things just beyond there that when you look at them in total can all add up to a large probability of exceeding the PAG's.

DR. REMICK: If I understand what those words mean you have just defined a large release in the safety goal is a release that will cause you to exceed the lower level PAG's at the site boundary?

MR. KING: One way to look at it is that you have a safety goal that has a 10 to the minus 7th for a large release value. That was in consideration of plants that are on the street today that have conventional emergency planning requirements out to 10 miles.

One way to look at this is saying, okay, if you want to do away with that conventional emergency planning beyond the site boundary, you have to have a ten to the minus 6th but not exceeding potential action guidelines. That is what you said is one way to look at this.

DR. REMICK: You basically defined it for these reactors that way, the large release? The fact that you tied it to the 10 to the minus 6th is where I'm getting the reaction.

MR. KING: Yes.

DR. REMICK: How far does that exceed the safety goal? How much of a ratchet is that over the safety goal itself? How inconsistent is that? Has anybody looked at it?

MR. KING: I can't give you a number. It is certainly well within the safety goal. I have looked at that but I don't have a specific value.

DR. REMICK: The ARCS was saying when you send these things maintain some consistency between the various levels. It seems to me this goes far below the safety goals required.

DR. LEWIS: He said it is well within the safety goals. He said they are not using it as a goal but as a boundary.

CHAIRMAN KERR: He means it goes beyond, is more stringent.

DR. REMICK: Yes.

MR. ROSZTOCZY: One way to look at this is if you meet Part 100 that assumes in it emergency action. Part 100 is a two hour zone at the low density because it assumes that within two hours you can evacuate the people. But the trouble with these plans is not to have such an emergency plan. So the criteria of what you see there is consistent with the safety goal but with an addition or assumption that there will be no emergency plan.

We are saying that we are using this only for the emergency plans, not for anything else. We are saying that if somebody wants to eliminate the emergency plan, then what would he have to do to show us that no emergency plan is needed. Part 100 obviously is not enough so that assumes an operation. So you have to go to something lower. And if it meets this limit then there is no limit even if nobody is evacuated from the area.

DR. REMICK: But isn't another way of possibly looking at it, and I'm not arguing with you but trying to understand where it comes from. The other way to look at it would be to say if with no evacuation you can assure us that you would not exceed the safety goal then it is okay. That might be the criteria and you don't know what you have here, how consistent it is with that or is it just kind of an arbitrary rationale approach but once again it puts in a grace conservatism?

MR. ROSZTOCZY: The Commission, in the various statements to us and I believe even in the safety goal statement, indicated that they considered emergency planning as an ugly line of defense and we are keeping that in mind.

DR. REMICK: I here the words but I'm not sure what it means.

MR. ROSZTOCZY: You keep in mind that it would eliminate it only in those cases where even if the worst things happen there is still no need for evacuation.

DR. REMICK: But don't you admit another way of looking at that is to say even without evacuation, if they met the safety goal, that might be the possible criteria here?

MR. ROSZTOCZY: The safety goal in itself provides guidance but doesn't give the limit at the location where you are looking at it.

DR. REMICK: Right.

MR. ROSZTOCZY: And I think that is where the difference is that this is a lower limit. This is a low enough limit that the various agencies including EPA, jointly arrived at as long as you are below these limits then no action is needed. Radiation levels are low enough that there is no action needed.

DR. REMICK: You are talking about the action?

MR. ROSZTOCZY: Yes.

DR. REMICK: But they didn't put in 10 to the minus 6th?

MR. ROSZTOCZY: No, that comes from the safety.

MR. KING: If there are LWR's that can meet the safety goals, maybe there are today. I don't have the numbers in front of me but they are still required to have evacuation out to 10 miles. Now, we are saying there are plans that don't want to do that. They ought to be required to have a more stringent requirement.

DR. REMICK: I don't know why because it seems to me if you met the safety goal of no evacuation you have met the safety goal. I realize it is not a requirement.

I guess the point I want to make, and I don't want to belabor it, you have got to convince me that what you have there is reasonable. I don't know if it is or not. I can't think it through at the moment. But if it is largely consistent with the safety goal then I think you are going to have to justify how you arrive at that.

MR. KING: If you had an LWR today that met the safety goal, would you propose they eliminate their EPZ or change it?

DR. SIESS: What safety goal are you talking about? I'm completely lost. People are using safety goal as if there were some number that--

MR. WARD: Well there is. I think Forrest is thinking about the upper level of safety goal, the health effects.

DR. SIESS: Quantitative health effects.

MR. WARD: Yes. If you could run through a whole analysis and show that a plant met that without giving any credit to an evacuation plan and then he would say what do you need an evacuation plan for, you don't. But they are starting down lower. They are starting down at 10 to the minus 6th and assuming that that has somehow been associated with existing plants where it is a given that they have evacuation plans.

Then they want to add another something in for these plants if they are going to be excused.

DR. SIESS: 10 to the minus 6th doesn't require an evacuation plan. That enters only when you try to define a large release.

DR. REMICK: Right. And they have defined a large release here.

MR. ROSZTOCZY: That is absolutely correct and I think we have to clear up the record on that. We were talking about not the safety goals, the contents of the safety goals. We were talking about the safety goal policy statement working together which includes in it the 10 to the minus 6th for large release. And the only thing that we suggested here is that there is no definition for the large release.

If you get into a different definition, we are saying that if you gave it a definition like Part 100, then that includes in it an evacuation and therefore you have to have an emergency planning program.

However, instead of defining it as Part 100, if you are willing to define it as an emergency action plan then you don't need to have an evacuation plan with it.

DR. SIESS: What do you mean by that, DIV.44?

MR. ROSZTOCZY: No, point 100 is a limit for a two hour dose and 30 day dose at two different locations.

DR. SIESS: So you are back to defining it, a large release, not as a release but as a does?

MR. ROSZTOCZY: That is right and if you do that, then you assume an evacuation so you ought to have a plan. However, if you go to the more stringent one that is on the board, in that case you don't have to have an evacuation plan. And we are using this differentiation only for one purpose, to decide whether that is needed for an evacuation.

DR. SIESS: Wasn't it suggested one time that the definition of large release would be one that would require an evacuation?

MR. WARD: That is exactly what they are doing. But see there is another effort in the staff to develop the so-called implementation program for the safety goal policy. Why don't you just defer to that instead.

DR. SIESS: Do you know what the staff is doing on implementing the safety goal?

MR. ROSZTOCZY: Yes, the staff is developing a definition for the large release criteria and the staff is developing an interpretation for these cases. It kind of goes hand in hand with whatever we come up with, that is what we will be using across the board.

The only thing new here is that here we are trying to do it both ways, without emergency planning and with emergency planning because it is being suggested that these plans are safe enough that there is no need for the emergency plan. So we are trying to establish the criteria, how would we decide whether it is needed or no needed.

DR. SIESS: If the other half of the staff is defining a large release as a release period, I don't see how you can say you are being consistent.

CHAIRMAN KERR: They are not being very consistent either.

MR. ROSZTOCZY: It didn't mean that the other part of the staff is divided or putting it in terms of a release. They are looking at various options including the dose as opposed to a limit. They are looking at the practicality of each of the different forms. Up to now the dose appears to be the most practical but there is no decision on it yet.

MR. LEWIS: In your definition you have this comment, the frequency of exceding the lower level should not exceed 10 to the minus 6th per year. Is this the midline frequency or is this with some confidence? How are you handling uncertainty in a precise comment like that?

MR. ROSZTOCZY: For this specific case, the policy statement of the safety goal is specific and it says that this is the mean frequency. It is so specified and so that is how we use it.

DR. LEWIS: So you do this through the mean with no consideration about uncertainty.

MR. ROSZTOCZY: That is correct. The uncertainty consideration already has been included in getting to the 10 to the minus 6th.

DR. LEWIS: No, they haven't been included. There is a mean with an enormous range of difference--

DR. SIESS: He means in setting 10 to the minus 6th, they have already considered the uncertainty in choosing that value.

DR. LEWIS: Well, how could you do that without specifying the uncertainty.

CHAIRMAN KERR: You are raising a question that he is not in a position to answer. The Commission set that criteria.

DR. SIESS: The commission set 10 to the minus 6th.

DR. LEWIS: But they have not taken into account uncertainty. This says nothing about uncertainty.

DR. SIESS: He doesn't know whether it they did or not.

CHAIRMAN KERR: Mr. King, we won't keep you more than two more minutes.

MR. KING: I'm finished. We did have a peer review of our proposal. I sent copies of the three letters from the three peer reviewers. You can read those yourselves and see what their thoughts were on this.

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DR. MOELLER: I don't know where it ties in but I had (read|red) prior to this meeting the latest proposal for the definition of an extraordinary nuclear occurrence. Now, how does the definition which they are tying to 100 RAD, how does the ENO tie into the definition of a major release?

DR. SIESS: At one time the Commission proposed that that be the definition.

DR. MOELLER: Yes.

DR. SIESS: Somebody else proposed it be the BAD's.

DR. MOELLER: The definition of the extraordinary nuclear occurrence and I want to know how all this fits together.

MR. ROSZTOCZY: The two are two different limits. The purpose of the type of limits that we are discussing here are limits to assure that there are no doses which would endanger the public. In the case of the ENO, the purpose is to simplify in case of something extraordinary, simplify the legal process. The only thing that the ENO accomplishes is that there is no burden of proof of negligence on the plaintiff.

The plaintiff still has to prove that he has been damaged and what is the amount of the damage but he has to prove no negligence on the part of this limit which is a higher limit. I think the actual damage has happened or there is a high probability that it will happen. It is a higher limit.

It is kind of a limit where the Commission makes a decision that it is large enough that the actual danger to human beings or to some land area has happened. And that is why we are asserting that roughly close to an order of magnitude higher than 100 RAD.

DR. MOELLER: And you are saying then a population can receive the PAG's without undue risk?

MR. ROSZTOCZY: That is right.

CHAIRMAN KERR: Gentlemen, we need to give Mr. Ward 15 minutes to discuss the schedule topic.

MR. WARD: Well, could Dr. Remick ask another question?

DR. REMICK: It is really a comment. I'd like to come back to the question of staffing. I must admit I have some skepticism on the ability to largely reduce the number of license personnel. But I think people should have the right to bring that forward. I would certainly want to keep an open mind on it.

The regulations themselves are very specific on staffing of license personnel and I doubt very much that there have been any exemptions. Licensees can ask for exemptions but this is a difficult way to go. It seems to me that that is a policy question that is being seriously proposed that you should think about raising that now. Would the Commission be receptive and you might say well we don't have to decide that now. We can decide that later.

But don't forget a control room should be designed with the staffing in mind. We have had a human factors seminar the other day and that was one of the things pointed out. The design of the control room and the people. I would propose to you that you give some thought to that. I think that is a policy question equal to the emergency planning question. So, I throw it cut to you.

DR. SIESS: Could I comment on that. I think the issues that they pulled out are ones that have to be settled before you can determine the viability of any of these concepts. I think that if emergency planning can't be eliminated, some of these things aren't going to fly. I think the containment requirement is not going to fly.

I would like to hear from the industry whether the operator staffing is really important to the viability of the concept before I put it in the same category as these things.

DR. REMICK: Well, I welcome to hear him speak to that too but I guess I don't see whether emergency planning flies or not to have an effect on the designs and the elimination of emergency planning.

DR. SIESS: It wouldn't affect the design but it would affect the sales. I don't think there would be one built.

CHAIRMAN KERR: Now we are getting into philosophy.

We thank you, Mr. King. We appreciate your being flexible with your schedule.

MR. WARD: Your staffing, what is your budget for continuing this work? You have laid out a schedule for the SER's and so forth for the next year I guess. Are you going to be able to accomplish that within the budget?

MR. KING: We have gotten the budget back. We have gotten 75 percent of our budget back so we are in good shape to complete the SER's on the schedule that was in the third or fourth viewgraph in the package and it is later this year. The HTGR, I believe, is in May and the LMR is in July.

MR. WARD: Very good. Thanks a lot.

DR. KERR: Systematic assessment of operating criteria?

DR. LEWIS: I have no real role to play here except to introduce Jack who will bring grist to our mill to be turned into flour, I suppose.

We are going to try to do this every couple of months just to try to get ourselves a little more abreast of what is going on.

MR. HELTEMES: Let me turn it over to MARK Williams who will give you the staff's presentation.

MR. WILLIAMS: We're glad we could come down today. The last time we got snowed out on this topic.

DR. REMICK: We're not going to get snowed out today?

MR. WILLIAMS: Well, we thought we were but it took a turn for the better.

DR. REMICK: I'm thinking about the committee.

MR. WILLIAMS: We came to talk about the NPRDS. In particular the first study we did to utilize NPRDS data. It has been a while since the Nuclear Power Commission assumed the management of NPRDS. In 1984 they made an effort to resculpt the program and build up that data system which now has in it all the component failure reports that we get as far as the systematic way and collecting them from the industry. That and the LDR data base are our two major sources of data and AEOD.

So this is really the first systematic study we have done to try to use the NPRDS data base to draw some conclusions about operating experience. It is on feed water flow control and bypass valves.

(Slide.)

So, by way of introduction I thought I would just talk a little bit and entertain any questions you had in general about the NPRDS and introduce the study. One of the interests we had in studying the feed water regulating valves and bypass valves is that our scram data from the 1986 report in particular gave us the information that most of the scrams are initiated by balance of plant equipment.

And when you follow it you find out that 10 percent of them are caused by either feed pumps, hardware failure or feed water regulating valves. This scram data is the subject of a study for 1987 which we are working on right now and we can probably cover that in detail at a future discussion. So, we have tried to characterize the values that we see at NPRDS and the two particular components, the feed water reg valves and bypass valves.

DR. REMICK: Is that statement true for all light water reactors or PWR's or BWR's?

MR. WILLIAMS: This is an all reactor statement. All LWR's, the studies on PWR's.

MR. EBERSOLE: Are you GOING to go to below the surface as the to why they fail?

MR. WILLIAMS: We will go to that level.

CHAIRMAN KERR: 60 percent of the scrams WERE caused by balance of plant.

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MR. WILLIAMS: They are initiated in balance of plant systems either people or hardware. That is a round number, either 55, 58, %6 about. It bounced around there.

Again I thought I would bring a chart of how NPRDS has grown over the years. Since our management we have been evaluating the NPRDS every year. But you can see since INPO assumed management in 1984, we have grown up over 60,000 failure reports. The system consists of engineering records for the equipment in the plant and failure records and now we have about 60,000 failure records to analyze:

So this is remarkable. A lot of people remember the NPRDS back down at this level and I really want to try to get the message across that it has changed. There have been major improvements in the data base since that time.

DR. LEWIS: A friend of mine published a book in which we established that all such curves follow the standard growth curve of a weed and the suitable change of ordinates. That was very close to that.

DR. REMICK: I hope the court reporter got that for posterity.

MR. WARD: I have got a question that is the inventory of what?

MR. WILLIAMS: Failure reports.

MR. WARD: There are two kinds of things that happen with NPRDS as I understand it, it is descriptions of equipment and then failure reports on equipment. And these are the failure reports?

MR. WILLIAMS: That is correct.

MR. WARD: There used to be a problem with getting the equipment descriptions. Is that well in hand?

MR. WILLIAMS: We just finished the Commission paper on the quality of the NPRDS overall, the status of it. Right now there is somewhere over a half million engineering records in it and when a plant goes commercial they should have all their engineering data on the reportable scope systems in the NPRDS.

The quality of that engineering data is still a problem and we focused on that and we intend to look into that further. Bob Denning has brought down some copies of that Commission paper and you can see a little bit more about that in detail.

MR. MICHELSON: Since NPRDS is not event

oriented, how did you get this scram information from the NPRDS?

MR. WILLIAMS: The scrams came from the LER's.

MR. MICHELSON: I thought in your first slide that you were telling me that you got information from the NPRDS system. You actually got the scrams from the LER and then what did you do, go into NPRDS to look at components or something?

MR. WILLIAMS: That is right. They are separate and distinct. The numbers on the causes of the initiators of scrams came from AEOD scram work?

MR. MICHELSON: So really the scram data came from the LER's and your 60 percent balance of plant figure, did that come from LER's or the NPRDS.

MR. HELTEMES: The 60 percent came from LER's, what Mark is saying is that went back to the causes of the scrams and tracked back to these components which then went into NPRDS to find out more detailed information on the failure of the components.

MR. MICHELSON: So, I was really looking at LER data when we looked at the first slide.

MR. WILLIAMS: That is based on LER data, that is correct.

MR. EBERSOLE: When you spoke of the quality of this data, I would venture to guess that most of the this equipment failed doing its normal day-to-day stuff and virtually none of it is addressing severe operation such as exposure of pipes that have failed or pumps going to run out or any of the things which are affiliated with any of the real critical transients and actions of the plant.

So you can therefore build a false sense of confidence on the reliability looking at performance data when everything is just cut and dried, day by day and none of it is flavored with the larger and more difficult challenge of operating in an emergency. What do you do with that?

MR. WILLIAMS: Let me see if I can understand the question.

MR. EBERSOLE: Well the classic one, most valves don't have much of a load on them when they go back and forth but when they are intercepting a pipe failure they have a big duty to perform. That is just one example.

MR. WILLIAMS: In an accident environment, no, the NPRDS does not capture that kind of date. It does capture catastrophic failures of equipment which is not what you are speaking to. If there is a common mode failure problem that has been experienced or if there is environmental qualification problems which would be captured by a licensee event reporting system, we would look to that data base to capture that kind of a problem.

The NPRDS really captures hopefully three kinds of failures, catastrophic failures but it is not the adverse environment and it captures degraded failures and then sometimes incipient failures, smoking and whatnot. So that is absolutely right. There is a grade of failures in here, some of which are not too severe at all.

MR. EBERSOLE: But the data that you're getting is what is used in the PRA's that show that the plant could recover from failures when, in fact, it might not.

MR. WILLIAMS: Some of the failure rates that we would like to use should come from NPRDS.

Okay, this is the first study. We have another study that is in the process of being completed now on feed water pumps. Then there is another one on main steam isolation valves that is still in the process in its statistical stage.

I would like to introduce G. L. Plumlee who is the lead engineer and primarily responsible for the feed water rate valve and bypass valve on this NPRDS work.

Bob Denning is the section leader and Vic Benaroya is in between Jack and Bob. So with that I will just turn it over to G. L. Were there any other questions in general?

(No response.)

MR. PLUMLEE: Good evening.

MR. MICHELSON: While he is getting ready let me ask a general question. You found the LER's and you found the particular trip event and then you went and found the failure report. What kind of percent luck did you have in finding the failure reports after knowing that the events were there?

MR. WILLIAMS: First of all on the Commission paper, AEO 1, we look at that. And in general I think the answer to your question is that we found about 63 to 75 percent of the failures that occurred in LER's.

MR. MICHELSON: In general, I'm wondering specifically on a knowledge that you have a focus on a particular problem, how good a luck did you have using NPRDS? How many of the failure reports did you find. It is a better test than what EIE is doing because it is a real world case you are investigateing.

MR. WILLIAMS: I think a lot of these would not be recordable to the LER requirements per se. I'm not sure they would really look at the failures we found.

MR. MICHELSON: Why wouldn't they be reportable if they were equipment failure?

MR. WILLIAMS: First of all these were feed water regulating valve failures. They didn't necessarily cause the event. They may not have caused the scram or the event and may not have been captured by the reporting requirement.

MR. MICHELSON: If I understood what you said you started by finding them in a LER so they caused an event enough to be reportable or maybe I misunderstood your process.

MR. WILLIAMS: Let me try to run through it. The processes were separate and distinct. The LER reporting system allowed us to look at the causes of scrams and from that we learned that feed reg valves are a primary initiator of scram.

16 Then we left the LER system alone and we turned to another system, NPRDS and we said what can it tell us about component failures of feed reg valves for operators.

MR. MICHELSON: I misunderstood then. I thought at least you looked up from the events you had and you looked at those failures in the NPRDS and then maybe others but I thought you looked at least for those?

MR. WILLIAMS: No, as it turns out we get more data just from the NPRDS.

MR. MICHELSON: You did a general study of both but not trying to couple the two?

MR. WILLIAMS: Right.

MR. MICHELSON: Thank you.

MR. PLUMLEE: The title of this report is Operational Experience Feedback on Main Feedwater Flow Control and Main Feedwater Flow Bypass Valves and Valve Operators.

(Slide.)

The primary purpose on this report was basically to provide operational experience feedback. Apparently, the report has gone out to all of the staff in the regional offices. You want to keep in mind while we are discussing this that we are talking about a proprietary data base.

At this point the report is in a proprietary form and I'm currently working on trying to issue a new reg that is in a nonproprietary version and that new reg will consist of both the valve study and the pump study.

As far as the scope goes, if you keep in mind during this discussion that it was the January of '84 through October '85 time frame that we are dealing with and the failures that occurred within that time frame. And basically, the reason for that was 1984 if you remember the slide we had up before is when NPRDS assumed management of it and we felt at that time we should see some good data start coming in.

And the reason we are just now getting here to discuss this is the report was actually started in 1986. We gave the data about a year to come in. As you will see in the NPOGS evaluation paper that, on the average, it takes about nine months for them to submit the reports and that is the industrial average. So we gave them a year and started collecting and analyzing the data in late 1986 and the report was actually issued in November of 1987.

We did, as Mark said, analyze the NPRDS data and the scope of the report was just for PWR control valves. And I did have a slide here which I didn't give you to help you visualize the scope of what we're concerned with here. Probably a lot of people are going to have questions about why did we just pick the hardware for the valves themselves.

(Slide.)

MR. EBERSOLE: Is this for motor and steam driven feedwater pumps.

MR. PLUMLEE: We are talking about feedwater valve.

MR. EBERSOLE: Sometimes with a steam system you can vary flow with steam flow and reduce the valve load but motor driven of course you have to have nothing but the valve. Is this for both steam and motor driven?

MR. PLUMLEE: No, sir. This is simply for the feedwater reg valve, what we call control valves and the bypass valves and all of the ones in the PWR study that we did that are pneumatically operated. This is just a representative picture.

This one is particularly for the Bailey. Our population didn't have any Bailey's in it. So I just wanted to snow you that as far as NPRDS goes, they treat the valve operator as one component and the valve itself as another component. To do our analysis, we combine these to create one functional unit. So the failures address the failure of the operator or the failure of the--

MR. EBERSOLE: A turbine driven pump has its own controller for feedwater flow and might not need a valve like that. Are you with me? You just control turbine speed?

MR. PLUMLEE: You mean for steam driven turbo pumps, right.

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MR. EBERSOLE: Every feedwater line has this irrespective of speed control pump?

MR. PLUMLEE: Every pump that was in our study had this type valve and I don't personally believe I have ever seen that speed water system that didn't have a valve on it no matter how much you could control the speed.

MR. EBERSOLE: So you had this in every case?

MR. PLUMLEE: Yes. We did not address what most people know as being the significant problems with feedwater control systems. That was not within the scope of this study.

(Slide.)

CHAIRMAN KERR: Did I understand you to say you did not look at feedwater control systems?

MR. PLUMLEE: That is correct.

CHAIRMAN KERR: Does that mean that the valve position is not part of the control system?

MR. PLUMLEE: The valve position, if you are talking about physically mounted on the valve--

CHAIRMAN KERR: Is that just an on/off valve, it is not a control?

MR. PLUMLEE: No, sir, it is the flow control valve that varies the position, to vary the flow.

CHAIRMAN KERR: I don't see how that could escape being part of the feedwater control. I must have misunderstood you.

MR. PLUMLEE: What I said was we did not address the feedwater control system, the electronics of the feedwater control system. The scope of this study was simply the valve itself and its operator and the air system as far as the air solenoids which are normally mounted on the operator here and the air lines that go to operate the operator. And that is inherent in the data base that we were dealing with, speaking of components.

CHAIRMAN KERR: It is your view that that was the principal contributor and the control system really had nothing to do with it?

MR. PLUMLEE: No, sir, I don't believe that is correct. We all know, at least from my experience and from the literature that I have researched and the operating experience that I have known, the major problem is the feedwater control system.

CHAIRMAN KERR: So you just picked the valve out because it was there?

MR. PLUMLEE: The selection was done before I came here. Let me put it that way. So I don't really myself understand why they didn't choose the control system over the valve system other than the fact that we wanted to use NPRDS as a test. This is basically a pilot study, the first attempt that we made at formally trying to use NPRDS and this was an easy topic for us to address.

MR. DENNING: Let me add some clarification. On the figures that were based on the LER data, the figure for hardware combined for reg valves and the pumps but at least as far as the definition of the component failure and what pieces of gear you would be dealing with, it is consistent with the boundaries that G. L. just pointed out.

CHAIRMAN KERR: What is consistent with what?

MR. PLUMLEE: Let me try to show it here. I would have to say without really analyzing where this came from--

MR. DENNING: Where we say hardware failure, that number means that for the valve anyway, that failure had to originate within the boundary that G. L. pointed out on his diagram, within the operator, attached solenoids, local air lines, valve body and valve position.

(Slide.)

MR. DENNING: Now, the part that we didn't deal with was the electronics and the sensors and the gear that is feeding change position signals to that valve. That is a another whole ball of wax.

DR. LEWIS: The predominant causes of failure of this system are in that part?

MR. DENNING: Looking across the scram data, I think that is probably correct. There is a whole lot of other BOP stuff that doesn't boil down to looking at this piece of hardware.

CHAIRMAN KERR: Which part when you say this part, the valve or the control system?

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DR. LEWIS: I don't remember how I phrased it but my understanding is that most of the failures are due to the control system but they still decided to study the boundary that is in that viewgraph.

MR. DENNING: One of the boundary conditions was how can we use NPRDS data.

DR. LEWIS: Now in NPRDS, just for my own information, the failures are broken down as to whether they are a control system or the actuator or shaft? Are the failures broken down in NPRDS in that way?

MR. DENNING: The way they are broken down is they are charged to a piece of hardware with a boundary definition.

DR. LEWIS: But if the failure of that thing with the name plate and model number was due to something outside that boundary, then it doesn't appear in NPRDS?

MR. DENNING: That is correct. In NPRDS if it was another piece of gear that was affecting its performance that was outside the boundary, another piece of hardware, the failure would get charged to that other piece of hardware.

DR. LEWIS: In other words, for each piece of hardware the cause of that failure is determined before it is put into NPRDS. Normally, an operator would only know that this valve failed and it takes an investigatory job to find out if that failure is due to something outside the boundaries so that it is done first.

MR. DENNING: In practice what happens is that the plant has people working on NPRDS that are in the stream of processing maintenance work orders. These guys know, in general, what the boundaries are that they are to report against to get a maintenance work order to come in. Maybe it is written against the valve. He looks at exactly what happened. He decides okay the thing that broke was in the boundary of the valve in NPRDS so I code this against the valve.

Then he looks at it and he says no, that thing failed because an improper signal was generated in a cabinet in another room. That sounds like a valve boundary. What I really have to charge that failure against is some electronic module in a control system.

DR. LEWIS: So he must be a generalist then and not a valve in order to make that last judgment?

MR. DENNING: Yes, generally the people that wind up processing the data have an overview. They are not the guys in the mechanics shop. They are not the guys writing the maintenance work requests.

They will go back and ask a guy in the shop if this is really what happened if they can't understand what has been put in the work order but it is a higher level that is involved in processing this.

MR. PLUMLEE: And I just got back this week from the NPRDS users group meeting in Atlanta at INPO and there is a big push to change over from the normal time reporters to an engineer doing the failure reports in an effort to provide better root cause analysis, better understanding of what the failure was.

(Slide.)

As far as the data analysis methodology. This was basically a two phase approach. One was a statistical analysis that was done on the failure population whereby times between failures were studied using statistical methods and model failure rates using times or failure free operation.

The specific component or failure rate was identified and calculated and these were compared in numerous statistical methods to the different variables that you can obtain from the NPRDS engineering records.

Some of those variables are such things as valve manufacturer, the valve size, the type valve it is as far as the valve operator, similar type information for the valve operator.

The failures were also studied as a function of calendar time to the tech shifts and the rate of component problems. And then, after the statistical analysis was done was where I entered the picture and the pointers that came out of the statistical analysis, I then took those and we did an engineering evaluation of those combined with our own operating experience as far as main feedwater control systems are concerned.

DR. LEWIS: When you speak of the statistical analysis is that deeper than just plotting the time between failures against various variables you described? Is it deeper than that?

MR. PLUMLEE: I believe I will let Bob answer that. He is the statistical individual?

MR. DENNING: Yes, I have got one slide that would give you a view of exactly what that consisted of.

DR. LEWIS: I'm not sure I want to know exactly.

CHAIRMAN KERR: How about statistically.

(Slide.)

MR. DENNING: The answer to your question is, yes. It involved more than just plotting and viewing and eyeballing information. You have a professional statistician on my staff that worked with a statistician and contractor and basically utilized the BMDP package to use survival analysis techniques just to apply to component survivals.

And using times between failures is the response variable. Looking at the impact or the effect of the different kinds of code areas, examples that G. L. gave you about the valve manufacturer, inlet size, type operator, type of material and so on and so forth and then there was screening that was done which is the first step in any kind of a statistical analysis, just forcing out the data as a function in those covariants to look at things that just don't make sense.

If everybody has 500 psig on something and one guy has got 250, you go find out why that is. If it is legit, maybe you leave it in. If it is not, you make the correction. We went through that process and then went through various available packages which were used to develop these trends or outliers or hints or significant areas that the data per se was pointing to.

And those were starting points for the engineers to see if there was any cause/effect relationship that they could attach to that significant variable.

DR. LEWIS: Do either of the professional statisticians know what underlies these packages. Anybody can run these packages.

MR. DENNING: As a matter of fact, in the process of doing this, we wound up taking a part one of the modules, one of the packages in correcting it and giving the correction back to the BMDP people and they got incorporated in the next :eg. So they got down into how the thing was coded.

DR. LEWIS: There were failure models imbedded in all these things?

MR. DENNING: The methods that were used because we went with time between failures and used life lengths instead of counts, we didn't presume any kind of an exponential model and the methods themselves are fairly general. They capture an exponential model as just one specialization of a whole lot of other things. We did some fitting and for certain values of the parameter the Y bell collapses to exponential. So we went out to very general perspective.

DR. LEWIS: I don't want to spend time on this but that sounds very specific to me.

MR. MICHELSON: Does the NPRDS allow you to determine time between failures now with any degree of reliability?

MR. DENNING: The answer is, yes.

MR. MICHELSON: Once they commit to starting to send the data on a particular component, would they always send the data in on that component if it fails again? Is that assured, otherwise you can't determine time between failure because you don't know if they report all the failures?

MR. DENNING: The same thing is true of the analysis in general?

MR. MICHELSON: I just wondered if there is a policy or practice wherein the utility starts to report a particular component failure that they continue it so that you realize that it isn't a long time between failure necessarily.

MR. WILLIAMS: They are on the hook to report those failures, each failure is reported, a reportable scope is set and within that they are required to be reported so if it fails the next time it has to be reported.

MR. MICHELSON: Are you telling me you are getting 100 percent participation and 100 percent of the failures by each participant?

MR. WILLIAMS: I wouldn't think so.

MR. MICHELSON: It used to be extremely poor although the accumulation of time is not what would be expected.

MR. WILLIAMS: We think it has plateaud out at somewhere over 60, less than 65.

MR. MICHELSON: So time between failure, when you recognize that they aren't reporting to you every time that component fails, how do you adjust that?

MR. WILLIAMS: I think they do report every time a component fails.

MR. MICHELSON: I'm sure they do but how do you know which ones do and which ones don't so you can get some confidence in your time between failures.

MR. WILLIAMS: Well, one of the things we do is we do plant visits and we have an understanding, especially on important failures, on important components. They do report those every time but there is some sloppiness about the actual time it was back in service and when it was discovered. But that is the only uncertainty you have there.

MR. MICHELSON: But you are confident that they are reporting each failure of at least major components?

MR. WILLIAMS: Well, if we continually find cases where they haven't reported a failure which may be a scram breaker which is fairly important. But in general, I think we're satisfied that they are reporting a lot more. For most of the component failures we are getting reports. I can't answer your question with certainty 100 percent.

MR. MICHELSON: If you looked at the LER and pulled that component from NPRDS you would have the answer of how successful they are?

MR. WILLIAMS: We have done exactly that, right. That is why I think we know the answer to the question to say most of the time--

MR. MICHELSON: I don't think you did exactly that or you gave me an incorrect answer earlier. I think you told me you didn't do that in this study.

MR. WILLIAMS: Not in this study but for other cases.

MR. MICHELSON: But I'm not sure that INEL is doing what I'm talking about either going to the LER and pulling the specific item and then checking to see if it was reported?

MR. DENNING: Yes, sir, that is what they do on a regular basis.

MR. MICHELSON: Yes, but my recollection is that when they have done this, they have not found a high percentage of correlation?

MR. DENNING: 65 to 70 percent.

MR. MICHELSON: Recognizing that 30 percent of the time you don't report how, do you get time between failure or how to you adjust time between failure.

MR. WILLIAMS: It gets confusing. First of all we have gone into that 30 percent in some gory detail and the significance of the failure comes into play. What failures don't we get reported and then what is the reportable scope when you start fine tuning it.

When we get into this level of detail sometimes we can get up to 85 to 90 percent of the failures being reported and we can resolve it at that level. And these plant visits we were making are helping us understand it better.

MR. MICHELSON: But in the case of these big valves you are confident that they are doing a high percentage of reporting; is that right?

MR. WILLIAMS: Well, I can say that this particular study, when you see the data I think you have a warmer feeling that we overkill the statistical analysis.

MR. PLUMLEE: I think I can answer your question if we get down here to the data methodology analysis. Under an engineering evaluation, that consisted of personally talking to every plant that we studied.

(Slide.)

At least for the outliers that I know of, we requested all failures and there was even some utilities that volunteered to send us the machinery, the machinery history records and we did find failures that had not been reported to NPRDS.

This whole process was a significant effort in trying to clean up the data because of the inherent problems in the voluntary reporting data base. And it took about two man months to clean that data up. In that process we did identify numerous problems. There are 40 pages of comments that we provided INPO. I think this whole process here has had a significant amount of positive results in trying to improve the NPRDS data system.

DR. LEWIS: I am missing a fundamental point. This is a failure reporting system. How do you calibrate MTBF if there are comparable components who don't fail and therefore that never find their way into the system. How is that normalized out?

MR. DENNING: Dr. Lewis, the way the system works is that the engineering records go in. That establishes the population and establishes who is at risk.

DR. LEWIS: So, it is normalized out.

MR. DENNING: And you accumulate against those components at risk.

DR. LEWIS: Thank you.

MR. PLUMLEE: So you see there is a lot of time here in contacting the licensees and the manufacturers.

DR. LEWIS: How are you guys doing on time?

MR. WILLIAMS: We will go faster.

MR. PLUMLEE: If we go back to the scope, this will give you an example of the failure population that we have been talking about.

(Slide.)

I tried to split this up to what you know as reg valves and bypass valves. As you see, what I have listed here is the total population we were dealing with and I listed it by what we discussed earlier, the engineering records. There was a total of 121 functional components that we were dealing with, both including the valve operator and the valve body itself. Out of that 121 for the reg valves, there were 107 failures and 42 units. For the bypass valves there were 101 total engineering records, 52 failures and 36 units.

Now, we have classified this term as an outlier and they came up from a statistical study based on their high failure rate, the high number of failures there was a total of 25 units that came out of that.

What I tried to do is compare in the study, we just looked once the statistical study was done, we just concentrated on the outlier plan. What I tried to do was show the reason we took that approach. As you can see those 25 units of the 42 contributed more than three quarters of the failures and that was broken up into just ten units.

For the bypass valves, there were a total of 34 failures and that is over half of the total failures and that was in only six plants. So the outliers were, basically, that population of plants that had a significant number of failures so that we could go to them and try to determine in some detail what exactly the problems were and how to fix it.

As I have broken the outliers down a little bit further into the valve and the valve operator, for the valve the failures were 24 out of 78. The valve operator was the biggest problem with 54 failures. For the bypass valve both the valve and the operator contributed evenly.

As far as the types of problems that you could identify in NPRDS, I broke them up into valve and operator. Primary contributors under the valve was the packing and bonnet flange leaks and valve internal problems. I don't know whether it is any use in going through the exact numbers here.

As far as the operators were concerned, major problems were in adjustment calibration of the operators, piece part replacements and piece part repairs and cleaning by the operators. We will go into that in a little more detail.

(Slide.)

Under the findings, the statistical study showed in the engineering and the engineering evaluation confirmed that the differences among units and stations have a greater influence on the components than any of the component attributes studied in the statistical analysis and by attributes I mean the manufacturer, the vendor, the valve inlet size, the valve operator type, whatever the variables that we analyzed that kept showing that the major differences showed up amongst the units.

One station could have three units and they would have three separate failure rates. And if you got looking more closely, they have three different maintenance policies and maintenance programs. In this study there were several data quality concerns which I discussed earlier we had to take account of and correct. These data quality concerns have been fed back to INPO through my participation in the NPRDS users group and they do have a formal computerized tracking system with all of our comments going to them and they track them right to closure.

MR. MICHELSON: You made a statement which was rather significant but maybe I misunderstood it. Did you say that on a three unit station it has different practices and procedures for each of the three units? I thought that is what you said. I find that rather profound.

MR. PLUMLEE: The engineering study identified that. Some plants use the same people from unit to unit. Some others don't. Each one has their own maintenance crew. Some plants, as you know, have one BWR and one PWR?

MR. MICHELSON: Mike say you have three PWR's--

DR. LEWIS: Well, you said they have different maintenance policies from unit to unit.

MR. MICHELSON: I find that fascinating.

MR. EBERSOLE: What percent of these valves are so-called safety grade and which are not?

MR. PLUMLEE: If you can just talk with memory, I only remember one plant and that is San Anofre that had safety grade. I don't know about the valves. I know the pumps at least were safety grade because they used that for cooling and I assume that the valves downstream are also the same.

MR. EBERSOLE: They are associated with swing check valves to intercept reverse flow if you have a pipe break. Reverse flow can be damaging unless it is quickly intercepted in the context of machinery damage in the plant. So you get into assessment of whether this is a safety problem or not, irrespective of the fact that it is clean water.

I thought there was sort of a random practice about it. Did you find most of the plant depended on swing checks for quick closure and that these things were not really included in the closing function?

MR. PLUMLEE: That is correct.

MR. EBERSOLE: But did you find some of then utilized these valves for the closure function?

MR. PLUMLEE: Not that I know of. We didn't specifically address that and I never heard that was the case.

MR. EBERSOLE: So it is kind of a random picture as to whether these do the safety function or not, isn't it?

MR. PLUMLEE: That's correct. I assume the ones that I remember were all nonsafety related.

MR. EBERSOLE: That is a funny thing because the safety aspect is not whether the feedwater comes out or not but whether it comes out in the room and keeps on going. And it seems to me it would certainly have to be associated with the swing checks as a safety.

CHAIRMAN KERR: Are you going to be able to finish your presentation in a few more minutes.

MR. PLUMLEE: I hope so.

AS indicated here, the major causes that we identified in both of these sets of valves and significant amount of problems are due to vibration, degraded instrument air system, degraded instrument air. I don't mean to say the whole system. Inadequate maintenance procedures, improper valve and valve internals, inadequate weather tightness.

To clarify that some plants, the balance of the plants are located outside. So plants that have components outside have problems with the air environment. Failure modes were attributed to poor maintenance practices, valve operator ability to withstand environmental vibration. That vibration was a direct result of both the pumps and the flow to the valve itself.

The valve operator inability to function due to poor quality instrument air, valve operator adjustment sensitivity, valve packing, lifetime and maintenance frequenc, and the literature there is currently a lot of research going on by EPRI to improve valve packing. The valve trim and plug in cage lifetimes.

To give you an example, you have them all listed there. I don't know whether there is time to go through all of them but I have broken these down into actions to prevent the problems.

(Slide.)

These were identified through the actual plant's experience and their corrective action. Tnis first slide is for valve operator phase. Significant contributor was due to vibrations. Some of the fixes that they used for these, not necessarily saying that these were true fixes to get at the root cause but they used flexible stainless steel.

CHAIRMAN KERR: Why don't you just read, in light of our time constraints.

MR. PLUMLEE: Poor maintenance is one of the big issues that came out of this study.

DR. LEWIS: You also had an entry that said maintenance frequency. I can't infer whether you meant maintenance frequency was too large or two small.

(Slide.)

MR. PLUMLEE: Major conclusions from the study is that proper maintenance and appropriate subcomponents will avoid the problems that we are seeing. System upgrades to a balance of plant system like the main feedwater system will make the system more reliable.

In the study, we identified a lot of problems with the instrument air. There have been a lot of plants that upgraded their instrument air more or less nearing the approach of upgrading of safety system.

CHAIRMAN KERR: What is meant by system upgrades to make the system more reliable?

MR. PLUMLEE: Larger air dryers.

CHAIRMAN KERR: Improving the system makes it more reliable?

MR. PLUMLEE: That is correct.

CHAIRMAN KERR: Thank you.

MR. PLUMLEE: Basically, the only thing that came out of this report is we felt it was a good practice document, that if plants would read the document, they could gain some experience on what has happened at other plants. It is not a general common practice that plants talk to each other.

Staff follow-up, I was in hopes that this report would be used and it has been used for the current staff efforts and balance of plant. There is a temporary instruction where they have gone out and inspected different plants. One of the recommendations that came out of this study was that they would look at one particular plant. It continued to be an outlier even after our study was finished. That has been done. The inspection was done last week and I talked to the region this morning. The relative issues that came out of that went right back into our findings in this report.

My concern was in the report you will see that we made some statements like if the plant does this, they should see an improvement down the road. My concern was if we put this report based on old data out today, is what we said back then a year ago still relevant.

So I went back and looked at current data up to July of 1987 and found one of the particular plants that was involved in the study was still considered an outlier, still having problems. So the region went back and looked at them and this balance of plant inspection and did indeed confirm that they have initiated a lot of effort to try to resolve their feedwater systems and there has been a significant improvement in trips or at least transients due to feedwater reg valves and failures as well as control system improvements.

MR. WILLIAMS: I think one of the biggest things out of the study was this was the first time we used NPRDS to try to get anything out of it. INPO has tried to use it and we have tried to use it. We found out a couple of things, one that it takes a heck of a lot of work to get anything out of it because of the data quality and a lot of other problems that Carl brought up.

The other thing is you can get information out of it. I remember there was one point that had four loops and one of the feed reg valves failed twice as much as the other three. And we sent this report over to NRR and two weeks after it got there the plug dropped off that valve and they had to manually scram the plant. Same exact thing, repetition of history once you wash it out we are working with INPO to try to keep NPRDS alive and well and improving.

We do see some advantage to studying it. We are going to continue to try to study it and get more out of it. It is labor intensive but this was the first time we tried to use it. So if you have any comments about what you think we should look at or areas of interest, we would like to take them and take them back with us.

MR. EBERSOLE: I'd first like to have you find out just exactly what each valve is for in the broadest context. The primary function is to modulate feedwater flow but it may have an extremely important safety feature and it may or may not have the safety essence to do it. In fact, I don't even know whether it would close or not under those differentials.

So the picture of these feedwater valves has always been very muddy and inconsistent. In a boiler, it is somewhat clearer because it is primary.

CHAIRMAN KERR: Other questions, comments?

(No response.)

Thank you, very much.

MR. PLUMLEE: Thank you.

CHAIRMAN KERR: It was an interesting presentation.

Next item?

MR. WILLIAMS: The second presentation, the issue of exposure events.

DR. LEWIS: I think we used all our time. We have to ask ourselves whether we have to ask you to come back or whether you want to continue. That is up to you.

CHAIRMAN KERR: We have a full schedule through the rest of the afternoon going through 6 p.m.

DR. LEWIS: I think we had better say that we cannot go on. We just have to ask you back. We obviously didn't match the length of the questions with your preparers time. Sorry about that.

CHAIRMAN KERR: Nuclear waste management.

DR. MOELLER: Mr. Chairman, you have in tab 9.1 the background information for this particular portion. If you look at the agenda that is presented there, one of the first items or the first item that was listed was the presentation by Dr. Michael Bell on high level waste. He is not here yet so I will go ahead and give the subcommittee report again because we are a little bit ahead of schedule.

We had a meeting--

MR. WARD: No, we're not.

DR. MOELLER: Your right.

We had a subcommittee meeting on January 21st and 22nd and that is what I'm here to report on at this time. Attending the subcommittee meeting was Dr. Steindler and myself and we were supported by four consultants of Frank Parker, John Till, Connie Crosshop and Donald Ord. We also had in attendance, of course, Jake Perry and Owen Mell.

The first item we heard is what you will be hearing this afternoon but from a different person. That is we heard a report by Bob Browning on the impacts of the Nuclear Waste Policy Act Amendments of 1987 which were signed on December 22nd, the impacts of these amendments on the high level waste program. As I say, you will here about that shortly.

One of the interesting things that I might mention without trying to go into any detail is that these amendments called for specific attention to sub-seabed disposal. We asked the NRC whether they were going to crank up and operate in this area and they said they were not because according to the federal statutes and so forth, EPA has the responsibility nor sub-seabed disposal.

We also discussed the licensing support system which you heard about before and that is the computerized system where they will incorporate into a computer data bank supporting data, references, etcetera from which all parties can draw. If there is some item that comes up in contention, everybody then will have the same data bank.

We found that we had a number of questions on that. It is being subjected to rulemaking for decisions on how it will be set up and so forth. Some of the questions we had when you get down into it, you began to ask questions and we wondered who inputs the data, who decides what references can go in and at what time do they go in, things like that. Can a person's personal laboratory notes go in or must it be published.

Next, we reviewed another rulemaking item and that is, when I last heard about that six or eight months ago, they were going to require that all people who submitted documents which they wished to have considered would put it in a format so they could feed it into this. Is that now in effect? Are things going into it from other people or anybody or just who is?

DR. MOELLER: Marty, maybe, can help me but my understanding is that it is still in the formulative stages.

DR. SHEWMON: Okay.

DR. MOELLER: The next item was all alternative methods for alternative low level waste. Alternatives to shallow land burial and that, as I say, is an item as I understand for rulemaking. In fact, I think they had to submit by a deadline of January 30th on that.

With the help of the Corps of Engineers they developed details on two approaches, two alternatives which they thought should receive emphasis. One is the below ground vault with the mounded concrete bunkers.

We found here though, we had some of the identical questions that the ACRS has on such topics and that is what determines whether you do it by rulemaking or by a regulatory guide, the standard review plan or a branch technical position. And we find we are not quite straight. So we want to get more into that.

The third thing we heard on the first day in terms of low level waste, was a review of the event at TMI 2 where the epicore supposedly solidified resins had expanded and cracked the carbon steel container in which they had been solidified. And when they cracked, they found they weren't solidified. They sort of had chunks fall out.

Fourthly, we heard what I thought was a very interesting presentation both from the NRC presentation and from DOE on the cleanup of the roughly two dozen sites left over from uranium mining and milling in past years, abandoned sites as well as active sites. And they spent, I gather, some billions of dollars in this. And it was a very well illustrated slide presentation showing us before and after and showing the actual steps as they recover a site.

We then closed out the first day with just a general discussion. I mentioned to you sub-seabed disposal being over in EPA. It is now beginning to register with us that MRS is in neither high level nor low level waste. That is over in another group within NMSS. Transportation of waste is still another group. So we will be interacting with quite a few groups there.

We closed out that day on an item pertaining to high level waste in our general discussion and that was we realized that with the amendments at the BWIP, the

Hanford site is to be shut down I think within six months.

Well, Dr. Steindler asked who was going to request and obtain from DOE and NRC and so forth a final closing out document. And I got the impression not too much thought had been given to that. But our point was that the people who were there, now that they are finishing up, they have insights that are not in published documents and written reports and somebody ought to summarize all of that information so that if and when, at some future time, we find ourselves working once again with this we will have the benefit of those written documents.

The second day we began with high level waste research--

CHAIRMAN KERR: You mean Dr. Steindler, Dr. Frazier--

DR. MOELLER: Well,, I'm not sure we did.

DR. STEINDLER: I think, just on the basis of pure economics, it is going to be very difficult to salvage that information.

DR. MOELLER: But I think it is a mistake if it isn't salvaged.

On the second day we heard from Frank Costanzi on the high level waste recycling program and Frank is here in case, as the discussion continues, you people have any questions.

One very interesting thing was his review of the research program of ground water movement of radionuclides which are being done in Australia using natural analogues to trace the movement of radionuclides. And they are tracing the movement of plutonium, the naturally occurring plutonium within that site. You know if there is spontaneous, fission some plutonium is there but I did not realize that they were doing this, neptunium, uranium, etcetera.

Next, we discussed environmental transport models. There, in terms of what NRC is doing through mainly Sandia and we raised the questions, once again, will the NRC models be acceptable to EPA when they use these models to show that DOE is complying or DOE uses similar models to show that they are complying with EPA standards. One interesting aspect that developed from that is the same people at Sandia, who are now doing the NRC research in model development, are the ones that did EPA's model development previously. So, it is hopeful that what they come up with will be acceptable to EPA since it is the same.

DR. SHEWMON: They ought to agree with EPA's models anyway.

DR. MOELLER: Right.

We also called upon the staff to look at field research in tuft and preferably at Yucca Mountain. And at the moment, I gather that DOE is the only one who has access and the only one who is really doing work there. But we hope that in time the NRC will be able to do onsite validation and so forth.

We also realized in our discussions that with the congressional mandate that we go to Yucca Mountain that we will be the only country in the world working with tuft. No one else is.

We closed out with a review of back to low level waste. The environmental transport studies that are underway in Canada which are very interesting in that they tried to have one group go in and model the site without being told how the radionuclides are moving. Another group go in and monitor the movement and see how well or how close they correlate in terms of their data.

They correlate pretty well. Personally and I think Marty too had questions as to how the values for these key parameters were chosen in order to get this close correlation. We wrapped up the two day meeting by drafting a letter which we want to put on the table for your consideration. It is a very simple letter commenting on high level and low level NRC research.

DR. SHEWMON: What do the Canadians have for a source. Do they have ET exchange down there?

DR. STEINDLER: It is a Chalk River. It is an old dump where they released the contaminated liquid from the NRX incident plus a number of other fairly hot sources just flush on to the ground and just simply watch the movement from there on.

To me it was a surprisingly large amount of activity but it didn't seem to have gone, over 25 or 30 years, it didn't seem to have wandered all that far. But it did wonder far enough so that you could use analytical models reasonably well and then prod the system to determine how close you were.

DR. SHEWMON: Did this get into the Chalk River?

DR. STEINDLER: No. The surprising thing to me was that this stuff flowed south instead of north. The river is on the north side and it flowed away from the river. It is a typical Canadian area which is 30 percent swamp and the rest untenable. Strike that from the minutes. But it was a swampy area and I would have expected the thing to eventually end up in the Chalk River but it didn't go that way. There was a lake to the south where it drained into.

But it was an interesting exercise. It is the only, what I would consider, large scale following of significant activity, no analytical problems in that area.

DR. SHEWMON: Was it clay or sand?

DR. STEINDLER: It seems to be basically a sandlike material.

DR. MOELLER: Yes, they passed a sample of the soil around and it is almost not like peat moss but it is more of a sand but it is light and fluffy.

DR. STEINDLER: If you mix stand with peat moss at a proper ratio, that is what you can get. You ought to be able to grow a lot of stuff in it. And in fact it is fairly shallow. The underlying rock is not too far below the surface but it is vegetative.

MR. EBERSOLE: Any strange growth?

DR. STEINDLER: No. The trees look like they glow in the dark but no.

DR. MOELLER: The trees, I forget whether it was birch or what takes the strontium 90 up.

CHAIRMAN KERR: Wait a second. This transcript is going in the public transcript. So please say the trees only glow in the daytime.

DR. STEINDLER: Let me explain the comment. They did take samples of the vegetation and to me at least there was a surprising selectivity of whatever the tree was, I guess it was birch for strontium.

MR. COSTANZI: I believe it was hickory.

DR. MOELLER: The interesting thing too was they said they could hold the Geiger counter by the trunk of these trees and it just buzzed and I couldn't see a beta meter doing that but they said it did. It just apparently had so much in it.

CHAIRMAN KERR: Well strontium 90 doesn't have a beta in it strong enough the, x-ray.

DR. MOELLER: I see.

DR. STEINDLER: These were somewhat old. So the it stronium 90 should have thrown into some extent.

DR. MOELLER: Martin, did you have any other comment?

DR. STEINDLER: The only comment I would like to make for the edification of the committee is I guess it came as somewhat of a surprise to me that the sub-seabed activity which Congress is now pushing on and is going to be turned over to the purview of the ER part of the Department of Energy rather than the waste management part, that that sub-seabed activity is going to be the purview of the EPA.

EPA will have to, if that takes hold, develop an infrasstructure akin to, at least to some extent, what the NRC has been struggling with for some time. Certainly, some of us are going to watch how efficient that process is going to be.

DR. SHEWMON: They would license the DOE propossal on that?

DR. STEINDLER: That is the impression that I'm currently under. It may not be correct.

DR. LEWIS: Is what you are calling sub-seabed what we used to call seabed disposal? Do you really mean below the seabed?

DR. STEINDLER: Yes, below the seabed penetrator.

DR. LEWIS: But that is within the seabed. Why are they calling it sub-seabed?

DR. MOELLER: You are right. It is within the seabed.

DR. LEWIS: That I have always supported. Seabed is a good idea. Sub-seabed is a bad idea.

DR. MOELLER: Are there any other comments before we call on Dr. Bell?

(No response.)

DR. MOELLER: He is going to give us a discussion of the impacts of the recent Nuclear Waste Policy Act and the waste program and NRC.

MR. BELL: Good afternoon and thank you, Dr.

Moeller. I'm Michael Bell, the Deputy Director of the Division of High-Level Waste Management of the NRC staff. I would like to spend a little time this afternoon going through the provisions of the recent Nuclear Waste Policy Amendments Act and then what steps the NRC staff is taking to react to it and what some of the impacts will be on our program.

Now, for completeness, I'm going to try to cover all the changes in the act although my division is really only responsible for the geologic repository for the high level waste and I may not be able to answer all the questions you may have about some of the other aspects. I will just be talking from the handout. I don't have slides.

Of course the major impact of the act was to narrow the site selection process immediately down to one site, the Yucca Mountain Nevada site. Under the previous law, DOE would characterize three sites and after they had studied three sites at depth in parallel for a period of several years, then would pick one.

The law essentially set up a process where it focused on one site now. DOE would look at that. If they found something that made that site unsuitable, then they would start a new site selection process to select a backup site. So the legislation has the advantage of perhaps saving some money if the Yucca Mountain Nevada site proves suitable and can proceed to be licensed. But if something is found to make it unsuitable, then it would cause a significant delay in the program to establish a high-level waste repository.

The act actually provides that within 90 days, all site-specific work at the Hanford and basalt site should be terminated. So DOE is taking actions to bring work to a close at those sites and the Commission is also taking some actions on its own program which I will be describing later.

Another major provision of the act is it postpones any action on a second repository until into the 21st century. About the year 2005, DOE is supposed to take another look at whether a second repository is needed and if it were then a new process would start. And so in conjunction with that, they have six months to terminate all their investigations into granite and crystal and rocks that had been on again, off again in the search for a second repository site.

Now, another provision of the act is it annuls, is the word that the law uses, DOE's proposal to construct the monitored retrieval storage at the Clinch River site in Oakridge. The act is curious in that it authorizes an MRS facility but then it rejects the facility that DOE had proposed, establishes a review commission to reopen the question about whether there is even a need for an MRS facility.

And then if this review commission indicates that there is such a need, then it requires DOE to start a new site selection process where they are not to be biased by the previous site selection process that they had already gone through.

Another key provision of the MRS part of the amendments act is it ties the schedule for the MRS to the repository schedule so that the department can't submit an application for an MRS unless constructor authorization application has been submitted for the repository.

So, this is intended so that the MRS can't become an alternative to the repository and if the repository never materializes, then the waste is left there permanently. But what it does is it takes away another potential backup for repository in the event that the Yucca Mountain site is found unsuitable. So, we could potentially find a situation where there is no backup geologic disposal site and there is no MRS site if the Yucca Mountain site fails and the waste would then have to remain in storage at reactor sites.

Moving away from the MRS, the law provides for what they call benefit agreements with the State of Nevada and with the host state and Indian tribes who might host an MRS if one comes to pass. However, the benefits in the bill are significantly reduced from earlier versions of the bill.

I'm sure you may have seen the discussions in the trade press and the newspapers where under the previous bill, the host state, while the repository was in operation would receive $100,000,000 a year and the host state for an MRS would receive $50,000,000 a year. These have been reduced in each case by a factor of five to $20,000,000 a year for the repository and $10,000,000 a year for the host state.

Another change from the earlier bill is that it provides for local government participation as well as state and Indian tribe participation. The local governments get to participate on these review commissions. They get to participate in the financial agreements. They have several ways in which they get a say in both the repository and MRS programs.

DR. SHEWMON: How was local defined? Is that just Bullfrog County or is it the county around Bullfrog County?

MR. BELL: I haven't focused on that particular aspect of it. I'm not sure it is that well defined. I have the legislation with me. I will be happy to take a look and see if I can answer it.

DR. SHEWMON: It is not anymore clear than you are right now?

MR. BELL: As I mentioned, one of the provisions of the benefits agreements is the state that enters into the benefits agreement gets to set up a review panel and to have certain opportunities to review, critique, participate in DOE's program to develop the facility.

Another provision of the act is that it establishes an Office of the Nuclear Waste Negotiator to be appointed by the president and this negotiator is to try to seek out states or tribes who would be willing to host either an MRS or a repository.

Now, in the case of the repository it is not really clear to us how this is going to work since the State of Nevada has already designated in the law the negotiator might be trying to line up a backup state in the event that the repository in Nevada were not successful. But he would clearly have a role in trying to find a location in which to site the MRS.

Another provision is that it establishes a nuclear waste technical review board that reviews the DOE program and semiannually has to report both to the

Congress and to the Secretary of Energy on virtually any aspect of the DOE program that it feels needs attention. This review board may be of interest to the ACRS or the to be established advisory committee on waste management in that some of its functions would appear to be similar to what the Commission's own advisory committees would be doing.

DR. SHEWMON: Who will set that up?

MR. BELL: The way the act describes this, the National Academy of Sciences nominates a slate of 22 eminent scientists, I believe is the term the law uses, to the president and the president selects 1 of these to serve on this technical review board. The review board has its own staff. It has essentially subpoena power. It can call on any federal agency to provide it any information or to produce documents, to show up at its hearings.

This appears to be very powerful. As was already mentioned, another aspect of the law is that it establishes an office of sub-seabed disposal research. This, I presume is a backup in the event that for some reason it is decided that deep disposal is an unsuitable technology. The exact functioning of this office and how it will relate to the Office of Civilian Radioactive Waste Management which is conducting the deep geologic repository program and the MRS program is still not very clear.

DR. SHEWMON: For many years Sandia had a repository program. Is that continuing or has that been cut off?

MR. BELL: The Sandia program within the last two years or so has either been entirely cut off or reduced to a very low level. And I presume that is one resource that if the people are still available could be used to support this office.

Finally, there are several provisions of the act relating to transportation. One requires NRC certification of DOE shipping casks for both spent fuel and solidified high-level waste. Now, before the amendments, the NRC and DOE had an interagency agreement that DOE would design its casks to the same certification requirements that NRC would apply to a commercial licensee. But now the act makes that a requirement.

There are a few other provisions dealing with transportation such as requiring DOE to adhere to the same rooting and notification requirements that commercial shippers must meet, requiring DOE to provide training for corridor states and local governments with regard to transportation accidents, emergency planning for transportation accidents. And then there are some provisions relating to the transport of plutonium by air.

Now, I'd like to go on. I'm primarily going to focus--

DR. MOELLER: Question?

DR. REMICK: Before you leave that page, going back to the site selection process for the MRS, does that rule out Clinch River ever or is it possible that under the new process Clinch River might be revised? Is that a possibility?

MR. BELL: The way I understand it Clinch River might be revised but it couldn't be given priority consideration. It would have to be sort of we will look at sites for an MRS anew and Clinch River would start out on equal footing with a potential site in Kentucky or West Virginia or South Carolina.

The next page identifies a number of actions we are taking in our program to respond to those parts of the legislation that affect the high-level waste repository program. Under the old law and under the amendments, the NRC still is required to make its licensing determination within three years after the construction application is submitted. So basically, those aspects of our programs, developing regulations, standard review plans or various guidance documents are still needed on about the same schedule as under the old law. And basically. Those parts of the program are unaffected.

We are continuing with site specific reviews of DOE documents in the Nevada site. As you may know, in January they published their draft site characterization plan for Nevada. The staff has that under review. By the end of this calendar year, they plan to publish their final site characterization plan and then after receiving comments on that, would expect to sink an exploratory shaft at the Yucca Mountain site in mid calendar year 1989. That is all assuming that the comments on their plans are such that they should proceed.

On the other hand, we also had begun to terminate all our site specific activities for the Texas and the Washington sites. Dr. Moeller mentioned the idea of summing up what was known about these other programs and the department had, in fact, developed their site characterization plans for both Texas and Nevada where they had identified what was known now about those sites and also laid out what investigations would need to be conducted in order to prove whether or not they were good sites.

And those documents were completed. As I understand it, DOE had just gone to put them in storage someplace and they would be available and it would serve very much the purpose that I believe you desired. But we won't be initiating any review of them. In fact, DOE didn't even release them.

We have eliminated our onsite representative at the Hanford site, Bob Cook. He is taking early retirement. We had not had an on site representative down in Smith County Texas. The DOE program had just moved their people down there a couple of months ago. We had not yet moved their onsite representative and so we are at least in a position where we don't have to abolish that position.

We have abolished our project manager positions for those two sites. In fact, those individuals have been moved over to the low-level waste program.

DR. REMICK: If I recall DOE had given a contract to Stone and Webster. Is that now terminated or will that be terminated in six months?

MR. BELL: That would really depend on how smart DOE was when they wrote the contract.

DR. REMICK: It was only a month or two old wasn't it?

MR. BELL: It was relatively recent.

DR. SHEWMON: The people that moved from Columbus down there are about a month or two old. How to get them back and what DOE owes them is sort of in the air or in negotiation, is what I hear.

MR. BELL: We are in the process of terminating all our technical assistance and research programs directed at the Texas and Washington sites and either just eliminating those contracts or refocusing those contracts to look at tuft for new generic work where appropriate.

Of the people who are on the review teams, we have taken five FTE's. I guess that equates to about five individuals have been transferred over to our fuel cycle licensing division. Four FTE's have gone to low-level waste and one individual has gone to our safeguards and transportation group structural engineer.

CHAIRMAN KERR: Mr. Bell, we had this scheduled to end by 3:15. I don't know what the presentation schedule is that you are following.

MR. BELL: I'm almost done. DOE itself has not reacted to the legislation by publishing the revised project decision schedules, mission plans or other planning documents. So in some respects, we will have to wait and see what some of their plans will be and some further adjustments in our programs will be needed.

In addition our various planning documents, the five year plans, strategic plan, things like that are all in the process of being revised.

Just one last page where I show you how our resources have been going for the last few years. They peaked in about 1986. As the DOE program has been slipping for the last few years, it had dropped somewhat in '87 and we had dropped from 105 to 88 FTE's at the beginning of FY '88. And then, as a result of the amendments, we have now reprogramed another 20 positions out of the high-level program and we are roughly about half the strength we were budgeted for just two years ago.

So that does conclude my presentation. I will be happy to answer questions at this time.

CHAIRMAN KERR: Are their questions?

MR. WARD: You have a new advisory committee to take up that slack?

DR. SHEWMON: There has been going on someplace over near you a review of the German shipping casks and conditions under which that would be allowed on the roads around here. Are there any reports on that that say what the status is?

MR. BELL: No, I can't say. I'm not familiar with that.

CHAIRMAN KERR: Further questions? Mr. Steindler?

DR. STEINDLER: I think it is necessary, you remind me, to correct the record Mr. Chairman. My ill-tempered comments about Canadian vegetation may be misunderstood. And as a consequence I wish to retract, emphatically, any comment about that for the record.

MR. WARD: You mean there is no swamp up there?

DR. STEINDLER: I was speaking largely of the radiological character of the vegetation. No, there is a great deal of swamp. In fact, the presence of the swamp made that study fairly broadly applicable if we can convince ourselves that the models that were used, it has a lot of tne new reg 1150 characteristics. If the models are, in fact, broadly applicable it will be a very useful study.

DR. SHEWMON: It may not be too applicable to Yucca Mountain.

DR. STEINDLER: But for low-level waste it is very applicable.

CHAIRMAN KERR: We thank you very much for your presentation. We will recess until 3:30.

(Whereupon, the recorded portion of the hearing was concluded at 3:15 o'clock, p.m.)

* * * * *

CERTIFICATE

This is to certify that the attached proceedings before the United States Nuclear Regulatory Commission in the matter of:

Name: 334th General Meeting

Docket Number:

Place: 1717 H Street, N. W.

Washington, D. C. 20555

Date: Friday, February 12, 1988

were held as herein appears, and that this is the original transcript thereof for the file of the United States Nuclear Regulatory Commission taken stenographically by me and, thereafter reduced to typewriting by me or under the direction of the court reporting company, and that the transcript is a true and accurate record of the foregoing proceedings.

Brenda R. Pearson

Brenda R. Pearson

Official Reporter

Heritage Reporting Corporation

NRC STAFF BRIEFING

TO ACRS

FEBRUARY 12, 1988

STEVEN D. RICHARDSON
ACTING DIRECTOR
TVA PROJECTS DIVISION
OFFICE OF SPECIAL PROJECTS

TVA RECOVERY SCHEDULE

(TVA PROJECTIONS)

PLANT		ESTIMATED RESTART DATE
SEQUOYAH	UNIT 2	MARCH, 1988
SEQUOYAH	UNIT 1	SIX MONTHS AFTER SQN 2
BROWNS FERRY	UNIT 2	FALL 1988
BROWNS FERRY	UNIT 1	SUMMER 1989
BROWNS FERRY	UNIT 3	SUMMER 1990
WATTS BAR	UNIT 1	FALL 1990
WATTS BAR	UNIT 2	1991
BELLEFONTE	UNITS 1 AND 2	EARLY TO MID 1990'S

MAJOR MILESTONES SINCE LAST ACRS MEETING

- INTEGRATED DESIGN INSPECTION
  - REPORT ISSUED NOVEMBER 6, 1987

- SEQUOYAH RESTART SER
  - ISSUED JANUARY 21, 1988

- COMMISSION BRIEFING JANUARY 20, 1988

- RESOLUTION OF EMPLOYEE CONCERNS

- RESOLUTION OF ALLEGATIONS

- OTHER MAJOR INSPECTIONS COMPLETED
  - EMERGENCY OPERATING PROCEDURES
  - OPERATIONAL READINESS
  - TRAINING
  - SYSTEM ALIGNMENT

OSP EVALUATION OF TVA MANAGEMENT

- NUCLEAR PERFORMANCE PLANS
  - CORPORATE PLAN (VOLUME 1) SER ISSUED JULY 1987
    - PROGRESS SEEN IN ALL AREAS
    - NRC REQUESTED 30 DAY NOTIFICATION PRIOR TO ANY PERMANENT ORGANIZATION OR PERSONNEL CHANGE
  - SEQUOYAH PLAN (VOLUME 2) SER ISSUED JANUARY 1988
    - 10 CFR 50.54(f) CONCERNS RESOLVED
    - PROGRAMMATIC IMPROVEMENTS SUFFICIENT TO SUPPORT NUCLEAR PLANT OPERATIONS
- IMPLEMENTATION MONITORED THROUGH OSP INSPECTION PROGRAM
  - PORC, NSRB, NMRG REVIEWS
  - MANAGEMENT REVIEW INSPECTION CONDUCTED SEPTEMBER 1987
- "ATTRIBUTES" REVIEW BY NRC
  - GENERALLY GOOD RESULTS
  - NUCLEAR WORK ETHIC NEEDS IMPROVEMENT
  - MANAGEMENT CHANGES ON SITE
- OTHER PROGRAMS
  - NEW EMPLOYEE CONCERN PROGRAM
  - H & I COUNSELING FOR SUPERVISORS

INTEGRATED DESIGN

INSPECTION

SEQUOYAH UNIT 2

EILEEN MCKENNA
SENIOR PROJECT MANAGER
TVA PROJECTS DIVISION
OFFICE OF SPECIAL PROJECTS

IDI INSPECTION REPORT (87-48)
CONCLUSIONS

- o OVERALL STRUCTURAL CAPACITY
  - * NEED FOR ADDITIONAL INDEPENDENT REVIEWS
- o VENDOR SEISMIC QUALIFICATION DOCUMENTS REVIEWED
- o PIPE SUPPORTS
- o PROGRAMMATIC OBSERVATIONS
  - * LACK OF TIMELY CORRECTIVE ACTIONS
  - * WEAKNESS IN DESIGN VERIFICATION PROCESS
  - * LACK OF TIMELY IMPLEMENTATION OF CHANGES TO STATION PROCEDURES RESULTING FROM DNE CHANGES
  - * LACK OF SYSTEMS INTEGRATION

IDI FOLLOWUP INSPECTION (87-74) SUMMARY

- o COMPREHENSIVE BROAD-BASED REVIEW OF SEQUOYAH STRUCTURAL DESIGN IS NOT NECESSARY

- o CASES REQUIRING FURTHER TVA REVIEW
  - * EQUIPMENT SUPPORTS
  - * SHEAR CAPACITY CALCULATIONS
  - * REINFORCING STEEL PLACED IN WALLS
  - * GENERATION OF VERTICAL SEISMIC LOADS
  - * VENDOR SEISMIC QUALIFICATION DOCUMENTATION
  - * MASONRY WALLS
  - * ACCESS CELLS
  - * SEISMIC ANALYSIS OF CONTAINMENT
  - * CONCRETE SLABS

IDI SUMMARY

- "VERTICAL SLICE" PROVIDED ADDED ASSURANCE THAT ISSUES HAVE BEEN RESOLVED AND CORRECTIVE ACTIONS IMPLEMENTED
- REVIEW EXTENDED HORIZONTALLY TO OTHER SYSTEMS, STRUCTURES, AND COMPONENTS FOR SPECIFIC CONCERNS RAISED BY IDI
- IN MANY AREAS, TVA HAD PERFORMED REFINED ENGINEERING ANALYSES TO OPTIMIZE DESIGN, RESULTING IN LESS DESIGN MARGIN IN SOME CASES
- INSPECTION PLANNED FOR FEBRUARY 15-19, 1988 TO REVIEW CIVIL ENGINEERING CALCULATIONS

OPERATIONAL READINESS/RESTART

J. BYNUM

OPERATIONAL READINESS

- CHARTER
  - ASSESS RESTART READINESS RELATIVE TO REQUIRED RESOURCES AND PERSONNEL PERFORMANCE
  - OBSERVE ACTIVITIES AND PERSONNEL DURING HEATUP
- PERIOD OF ASSESSMENT
  - AUGUST 1987 THROUGH JANUARY 1988
  - INTERIM REPORT ISSUED OCTOBER 1987

AREAS OF CONCERNS

- MANAGEMENT INVOLVEMENT
- STANDARDS OF PERFORMANCE
- ADMINISTRATIVE CONTROLS

MANAGEMENT INVOLVEMENT

- ORGANIZATION
  - MANAGEMENT DUTY ROSTER
  - REDUCTION IN MANAGEMENT LAYERS
  - INCREASE NUMBER OF FIELD SUPERVISORS
  - OPERATIONS RESPONSIBILITY FOR UNIT 1, UNIT 2, AND COMMON EQUIPMENT
  - PARTICIPATION IN TRAINING
- COMMUNICATION
  - DAILY PLAN OF DAY MEETINGS ('WAR ROOM')
  - DAILY PLANT STATUS REPORTS
  - PERIODIC MEETINGS WITH ALL PERSONNEL
  - CONDUCT OF OPERATIONS PROCEDURES

ADMINISTRATIVE CONTROLS

- ADMINISTRATIVE PROCEDURE REVISIONS
- TRAINING CONDUCTED
- ON-SHIFT OBSERVATIONS

OPERATIONAL READINESS

- STANDARDS OF OPERATIONS
- PLANT ADMINISTRATIVE CONTROL
- QUALIFICATION OF AUOs
- RADCON STAFF/SHIFT
- CHEMISTRY STAFF/SHIFT
- DEMONSTRATION OF PERFORMANCE

CALCULATION PROGRAM

J. KIRKEBO, DIRECTOR

DIVISION OF NUCLEAR ENGINEERING

PROGRAM OBJECTIVES

- AVAILABILITY AND RETRIEVABLILITY
  - EXISTENCE
  - RETRIEVABILITY
- TECHNICAL ADEQUACY
  - PERFORM TECHNICAL REVIEWS
  - CALCULATIONS INTEGRATION (CCRIS)
  - UNVERIFIED ASSUMPTIONS
  - LICENSING/CALCULATION COMPATIBILITY
- CORRECTIVE ACTIONS

SCOPE

UNIT 2 AND COMMON

DISCIPLINE	NUMBER OF CALCULATIONS
• ELECTRICAL	685
• MECHANICAL	411
• NUCLEAR	397
• CIVIL STRUCTURAL	1,739
• ENGINEERING MECHANICS	8,998
TOTAL	12,230

CHRONOLOGY

- JANUARY 1987 INITIAL PROGRAM SUBMITTAL
- JANUARY 1987 TVA ENGINEERING ASSURANCE AUDIT
- FEBRUARY 1987 NRC AUDIT
- APRIL 1987 TVA ENGINEERING ASSURANCE FOLLOWUP
- MAY 21, 1987 MEETING WITH NRC
  - SAMPLE EXTENDED
- JUNE 1987 NRC AUDIT
- SEPTEMBER 1987 TVA ENGINEERING ASSURANCE FOLLOWUP
- OCTOBER 1987 NRC CLOSEOUT AUDIT
- JANUARY 1988 TVA ENGINEERING ASSURANCE FOLLOWUP

STATUS AND RESULTS

CORRECTIVE ACTION*

- 70% OKAY
- 4% REVISED
- 26% REGENERATED
- <1% HARDWARE MODIFICATIONS

*EXCLUDING PIPE SUPPORTS

STATUS AND RESULTS

CORRECTIVE ACTION

SUPPORTS ON CATEGORY I RIGOROUSLY ANALYZED PIPE

- 100% REGENERATED
- 3% PRE-RESTART HARDWARE MODIFICATIONS
- 8% POST-RESTART HARDWARE MODIFICATIONS

SUMMARY

- TECHNICAL ADEQUACY
- AVAILABILITY AND RETRIEVABILITY
- CORRECTIVE ACTIONS
  - CCRIS
  - INDEPENDENT REVIEW
  - PROJECT RESPONSIBILITY

DESIGN BASELINE AND VERIFICATION PROGRAM

J. COX

DESIGN BASELINE AND VERIFICATION PROGRAM

<u>OBJECTIVES</u>

- RESTORE CONFIDENCE IN DESIGN CONTROL PROCESS
- RETRIEVE DESIGN BASIS
- REVIEW CHANGE DOCUMENTS
- REVIEW AS-CONSTRUCTED WITH PLANT CONFIGURATION
- RECONCILE CONFIGURATION WITH DESIGN BASIS
- ATTAIN BASELINE AND CONFIRM MODIFICATIONS DO NOT DEGRADE SAFETY FUNCTIONS

ELEMENTS OF PRESENT DESIGN CHANGE CONTROL PROGRAM

- MODIFICATIONS ISSUED BY CHANGE PACKAGE
- RESOLVES DIFFERENCES BETWEEN AS-DESIGNED AND AS-BUILT DRAWINGS
- CCB EVALUATION TO ELIMINATE UNNECESSARY CHANGES
- LIMITS MODIFICATION SCOPE FOR TIMELY CLOSURE
- ASSIGNS DESIGN AUTHORITY TO ENGINEERING

DESIGN BASELINE AND VERIFICATION PROGRAM

<u>MAJOR PROGRAM ELEMENTS</u>

- EA OVERSIGHT REVIEW
- DESIGN CRITERIA AND COMMITMENTS
- SYSTEM WALKDOWN/TEST
- REVIEW OF PLANT CHANGES
- SYSTEM EVALUATION
- CORRECTIVE ACTION PROCESS

DESIGN BASELINE AND VERIFICATION PROGRAM

RESULTS

- DESIGN BASE REESTABLISHED
- PLANT CONFIGURATION DOCUMENTED
- CHANGES VERIFIED
- CHANGE CONTROL PROCESS ESTABLISHED
- SUCCESSFULLY RECONCILED DESIGN CONTROL ISSUES

TVA PERSPECTIVE
INDEPENDENT DESIGN INSPECTION (IDI)

D. WILSON
TVA IDI ENGINEERING TEAM LEADER

- GOAL
- DEDICATED TEAM
  - 25 FULLTIME - 60 AT PEAK
- QUALITY PERSONNEL
  - LEAD ENGINEERS
  - SENIOR ENGINEERS
  - TOP MANAGEMENT
  - CONSULTANTS
- IN DEPTH SUPPORT
  - TOTAL OF 800 INDIVIDUAL REQUESTS FOR INFORMATION

- NRC REVIEW
  - IN DEPTH
  - RIGOROUS
- REVIEWERS
- SCOPE
  - DESIGN
  - CONSTRUCTION
  - OPERATIONS

TVA CATEGORIZATION OF NRC FINDINGS

	MECH.	MECH. COMP.	CIVIL	I&C	ELEC.	TOTAL
• DEFICIENCIES						
- ENG.	4	9	1	4	0	18
- MINOR CALC ERROR	2	2	4	0	0	8
- OPERATIONS	2	0	0	1	0	3
• NO DEFICIENCY	1	6	4	7	2	20
• DOCUMENTATION	1	7	10	3	3	32
• OBSERVATIONS	0	0	0	2	3	5
TOTAL	18	24	19	17	8	86

CONCLUSIONS

- MAJORITY OF IDI ISSUES RESOLVED BY REANALYSIS
- ADEQUATE DESIGN MARGINS DO EXIST
- NO MAJOR CHANGES TO PROGRAMS OR NUCLEAR PERFORMANCE PLAN

DIESEL GENERATOR ISSUES

J. HUTSON

DIESEL GENERATOR ISSUES

- VOLTAGE AND FREQUENCY

CARBON DIOXIDE FIRE PROTECTION

- QUESTION
  - SEISMIC QUALIFICATION
  - EFFECT ON DIESEL GENERATOR OPERATION
- RESPONSE
  - DIESEL AIR INTAKE HARD PIPED TO OUTSIDE AIR
  - TESTS AT WATTS BAR NUCLEAR PLANT

RES STAFF PRESENTATION TO THE ACRS

SUBJECT: Proposed Approach to Resolution of Key Issues Associated with Advanced Reactors

DATE: February 11, 1988

PRESENTER: Thomas L. King

PRESENTER'S TITLE/BRANCH/DIV: Branch Chief
Advanced Reactors & Generic Issues Branch
Division of Regulatory Applications

PRESENTER'S NRC TEL. NO.: 492-3765

SUBCOMMITTEE: Full Committee

Presentation Outline

- Purpose of Presentation
- Background
- Status of Staff Review of DOE Advanced Reactor Concepts
- Overall Approach to Review
- General Criteria for Advanced Reactors
- Specific Criteria for Key Issues:
  - Accident selection
  - Siting source term and use
  - Containment
  - Emergency Planning
- Policy Questions
- Application of Criteria
- Peer Review

PURPOSE OF PRESENTATION

- TO PRESENT FOR THE FULL COMMITTEE'S REVIEW AND DISCUSSION A SET OF CRITERIA WHICH THE STAFF PROPOSES TO USE IN THE REVIEW OF THE THREE DOE SPONSORED ADVANCED REACTOR CONCEPTS TO ASSESS THE ISSUES OF:
  - ACCIDENT SELECTION
  - SOURCE TERM SELECTION
  - ADEQUACY OF CONTAINMENT
  - ADEQUACY OF OFFSITE EMERGENCY PLANNING
- COMMISSION REQUESTED STAFF RECOMMENDATION ON THE CRITERIA TO BE USED FOR KEY ISSUES. STAFF HAS PREPARED A DRAFT COMMISSION PAPER (COPIES PROVIDED TO ACRS).
- SUBCOMMITTEE HAS BEEN BRIEFED ON THE STAFF RECOMMENDATIONS ON JANUARY 6, 1988.
- AN ACRS LETTER ON THE STAFF PROPOSAL IS REQUESTED

BACKGROUND

- FOR APPROXIMATELY THE PAST YEAR, RES HAS HAD UNDER REVIEW THREE DOE SPONSORED ADVANCED REACTOR CONCEPTS:

  - 350 MWT MODULAR HTGR
  - 425 MWT MODULAR LMR (PRISM)
  - 900 MWT MODULAR LMR (SAFR)

- REVIEW IS BEING CONDUCTED IN ACCORDANCE WITH THE COMMISSION'S ADVANCED REACTOR POLICY STATEMENT.

- OUTPUT FROM REVIEWS:

  - PRELIMINARY GUIDANCE ON LICENSING REQUIREMENTS
  - POTENTIAL OF DESIGN TO MEET THESE REQUIREMENTS, INCLUDING R&D NEEDS.
  - DOCUMENTED VIA SERs. (SERs TO BE PROVIDED TO NRR, ACRS, CRGR AND COMMISSION PRIOR TO ISSUANCE). SERs WOULD BE USED BY NRR AS THE STARTING POINT FOR CONDUCTING A LICENSING REVIEW, IF AND WHEN A FORMAL APPLICATION IS FILED.

- RES REVIEW CONSISTS OF:

  - STAFF REVIEW OF DESIGN (IDENTIFY SAFETY ISSUES/R&D NEEDS EVALUATE DESIGN)
  - CONTRACTOR (BNL/ORNL) SUPPORT IN REVIEW OF DESIGN AND INDENPENDENT EVALUATION OF KEY SAFETY CHARACTERISTICS

STATUS OF STAFF REVIEW

COMMISSION PAPERS ON:

- KEY ISSUES - DRAFT PREPARED AND UNDER REVIEW
  - TO COMMISSION - 3/88

- STANDARDIZATION - DRAFT PREPARED AND UNDER REVIEW
  - TO COMMISSION - 3/88

SERs

- MHTGR - DRAFT ALMOST COMPLETE
  - TO COMMISSION - 5/88

- LMRs - DRAFT TO BE COMPLETED - 3/88
  - TO COMMISSION - 7/88

- PLAN TO HAVE ACRS REVIEW SERs PRIOR TO TRANSMITTAL TO COMMISSION

SUMMARY OF DOE PROPOSED TREATMENT OF KEY ISSUES

1) SELECTION OF ACCIDENTS:
   - MHTGR - SELECTED VIA PRA - AOOs - $P \gtrsim 2X10^{-2}$/YR
     - DBAs - $2.5X10^{-2}$/YR $< P < 10^{-4}$/YR
     - EPBE - 10^{-4}/YR $< P < 5X10^{-7}$/YR

   - LMRS - AOOs/DBAs - SELECTED SIMILAR TO CRBR
     - SEVERE EVENTS - SELECTED USING PRA + ENG. JUDGEMENT

2) SOURCE TERMS:
   - MHTGR - MECHANISTIC

   - LMRS - MECHANISTIC EXCEPT FOR SSST:
     - PRISM - 100% NG/0.1% HALOGENS/ 0.1% PARTICULATE/0.01% TRANSURANICS
     - SAFR - SINGLE ASSEMBLY MELTDOWN

3) CONTAINMENT:
   - MHTGR - FUEL PERFORMS CONTAINMENT FUNCTION

   - LMRs - PRISM - GV/RV HEAD PROVIDES LOW PRESSURE/LOW VOLUME CONTAINMENT

     - SAFR -GV/RV HEAD + SECONDARY CONTAINMENT STRUCTURE

4) EP:
   - MHTGR - EVENTS DOWN TO $5X10^{-7}$/YR CONSIDERED
     - SET EPZ AT SITE BOUNDARY

   - LMRs - DBAs + SEVERE EVENTS CONSIDERED
     - SET EPZ AT SITE BOUNDARY

OVERALL APPPOACH

REQUIREMENT - FROM THE COMMISSION'S ADVANCED REACTOR POLICY STATEMENT: ADVANCED REACTORS MUST, AS A MINIMUM, PROVIDE AT LEAST THE SAME DEGREE OF PROTECTION OF THE PUBLIC AND THE ENVIRONMENT THAT IS REQUIRED FOR CURRENT GENERATION LWRS. HOWEVER, THE COMMISSION EXPECTS ADVANCED DESIGNS TO PROVIDE ENHANCED MARGINS OF SAFETY.

APPROACH - GENERAL CRITERIA DEVELOPED TO DEFINE BROAD FRAMEWORK OF SAFETY REQUIREMENTS. SPECIFIC CRITERIA DEVELOPED TO IMPLEMENT GENERAL CRITERIA IN THE FOUR KEY AREAS.

- THE CRITERIA ARE STRUCTURED TO:
  - DEFINE MINIMUM REQUIREMENTS TO ENSURE AT LEAST AN EQUIVALENT LEVEL OF SAFETY AS LWRS (ADEQUATE PROTECTION).
  - ADDRESS ENHANCED SAFETY

- SAFETY GUIDANCE PROMULGATED FOR LWRS USED AS THE BASIS TO DEVELOP THE CRITERIA FOR ADVANCED REACTORS:
  - SEVERE ACCIDENT POLICY
  - SAFETY GOAL POLICY
  - STANDARDIZATION POLICY

- CRITERIA DEVELOPED INDEPENDENT OF REACTOR TYPE, AS MUCH AS POSSIBLE.
- BASED ON TECHNICAL CONSIDERATIONS ONLY.

GENERAL CRITERIA

I) CRITERIA WHICH MUST BE MET TO ENSURE AN EQUIVALENT LEVEL OF SAFETY AS LWRs (ADEQUATE PROTECTION):

- COMPLY WITH EXISTING RULES AND REGULATIONS, AS INTERPRETED FOR ADVANCED REACTOR CONCEPTS, WITH THE FOLLOWING MAJOR EXCEPTIONS:

  - USE SOURCE TERM BASED UPON MECHANISTIC ANALYSIS IN LIEU OF TID - 14844 TYPE SOURCE TERM.
  - CONTAINMENT FUNCTION MAY BE PERFORMED IN A FASHION DIFFERENT THAN FOR LWRs.
  - EMERGENCY PLANNING COULD BE MODIFIED TO REFLECT PLANT SAFETY CHARACTERISTICS.

  (SPECIFIC CRITERIA DEVELOPED FOR SUBSTITUTION IN THESE AREAS)

- COMPLY WITH THE INTENT OF THE SEVERE ACCIDENT REQUIREMENTS, WHICH ARE PRESENTLY BEING FORMULATED FOR LWRs:

  - MEET PROCEDURAL CRITERIA GIVEN IN SAPs.
  - IDENTIFY IMPORTANT SEVERE EVENTS TO BE CONSIDERED IN THE DESIGN (DESIGN DEPENDENT).
  - EVALUATE DESIGN FEATURES INCORPORATED TO PREVENT SEVERE ACCIDENTS (DESIGN DEPENDENT).

- Evaluate design features provided for mitigation and accident management (design dependent).

- Show fission product retention capability at least equivalent to LWRs (i.e. for equivalent classes of events, criteria for FP release from advanced reactors should be the same or better than for LWRs.)

- Maintain the "defense in depth" concept; however, in its application consideration should be given to the safety characteristics of the advanced plants. Ensure "defense in depth" in performing key safety functions via deterministically requiring:

  - Two diverse, independent means of reactor shutdown, each of which is capable of shutting down the reactor assuming a single active failure. One of the systems must be capable of bringing the plant to cold shutdown.
  - Two diverse, independent means of decay heat removal, each of which is capable of removing decay heat assuming a single active failure.
  - Multiple barriers to fission product release.

- To account for the reduced experience, as compared to LWRs, designs which utilize new innovative features to perform their safety functions must demonstrate, via testing, the ability of these features to prevent or accommodate accidents (DBAs + a range of severe accidents)

PRIOR TO DESIGN CERTIFICATION. SPECIFICS OF PLANT TESTING CAN BE DETEMINED ON A CASE BY CASE BASIS BUT GENERALLY SHOULD INCLUDE SOME TESTING ON A FULL SIZE REACTOR MODULE.

- APPLY ENHANCED QA, SURVEILLANCE, IN-SERVICE INSPECTION/ TESTING, AS NECESSARY, TO ENSURE NEW/INNOVATIVE FEATURES PERFORM WITHIN ACCEPTABLE LIMITS OVER THE LIFE OF THE PLANT.

II) REQUIREMENTS ASSOCIATED WITH ASSESSMENT OF ENHANCED SAFETY

- APPLICANT SHOULD ASSESS AND DOCUMENT ENHANCED SAFETY CHARACTERISTICS/MARGINS:
    - LONG RESPONSE TIME
    - REDUCED POTENTIAL FOR OPERATOR ERROR
    - CAPABILITY TO RETAIN FP
    - HIGHLY RELIABLE SAFETY SYSTEMS (PASSIVE/INHERENT CHARACTERISTICS)
    - SIMPLIFICATION (SYSTEMS/ANALYSIS)

- POTENTIAL IMPROVEMENTS IN SAFETY ARE TO BE CONSIDERED WHEN THE MARGINS ARE SMALL OR WHEN LARGE IMPROVEMENTS IN SAFETY CAN BE REALIZED WITH REASONABLE COST. THESE IMPROVEMENTS COULD BE SELECTED FOR ANALYSIS AND IMPLEMENTED USING ENGINEERING JUDGEMENT.

- DEMONSTRATE ENHANCED SAFETY/MARGINS VIA TESTING.

COMPONENTS OF DEFENSE IN DEPTH

PREVENTION

- Reliable plant systems:
  - reduce challenges to safety systems
- Reduce potential for human error*
- Conservative design:
  - Plant performance
  - Plant performance
  - Barrier integrity
- Control stability
- Quality assurance:
  - Design
  - Construction
  - Operation
- Good Oper./Maint. and training
- Safeguards and Security
- Supporting R&D and testing

PROTECTION

- Reliable independent redundant safety systems:
  - Reactor shutdown (active**/passive*)
  - Decay heat removal (active**/passive*)
- Maintain integrity of barriers to release of radioactive material under:
  - EC-I
  - EC-II
  - EC-III*
  - EC-IV*
  - Enhanced fuel integrity*(MHTGR)
  - Double reactor vessel*(LMRs)
- Long response time*
- Control stability
- Minimize need for human intervention*
- Emergency procedures

MITIGATION

- ESFS**
  - Spray systems
  - Filtering systems
  - Cooling systems
- Conventional containment building**
- Physical phenomena
  - FP holdup
  - FP plateout
  - FP decay
- Long response time*
- Emergency Procedures

EMERGENCY PLANNING

- Preplanned Evacuation/Sheltering**
- Ad hoc evacuation* (Long response time)

* Key features in defense in depth that are utilized to a greater degree in advanced reactors than in current generation LWR designs.

** Key features in defense in depth that are utilized to a lesser degree in advanced reactors than in current generation LWR designs.

Specific Criteria

Accident Selection

Establish four categories of events which must be considered as defined below:

1) Event Category I (EC-I)

   - Equivalent to anticipated operational occurrences.
   - Select via engineering judgement, complemented by PRA and generally includes events with a frequency down to approximately 10^{-2}/yr.
   - Used for establishing compliance with 40CFR190 and 10CFR50, Appendix I.

2) Event Category II (EC-II)

   - Equivalent to postulated accidents/DBAs.
   - Selected via engineering judgement, complemented by PRA and generally include events with a frequency down to approximately 10^{-4}/yr plus some traditional events.
   - Used in siting determination as described later.
   - Conservative analysis (single failure criteria, no credit for non-safety grade equipment, etc.).

3) Event Category III (EC-III)

   - Equivalent to the range of severe accidents beyond the traditional DBAs which should be considered in the design consistent with the Commission's Severe Accident and Safety Goal Policy Statement.
   - Selected via engineering judgement, complemented by PRA and includes:

- INTERNAL EVENTS WITH A FREQUENCY DOWN TO APPROXIMATELY 10^{-7}/YR.
    - EXTERNAL EVENTS CONSISTENT WITH WHAT IS TO BE APPLIED TO LWRs AS PART OF SAPs IMPLEMENTATION.
    - BOUNDING EVENTS SELECTED BY ENGINEERING JUDGEMENT TO BOUND UNCERTAINTIES, AS DESCRIBED LATER.

- USED IN SITING DETERMINATION AS DESCRIBED LATER.
- BEST ESTIMATE ANALYSIS.

4) EVENT CATEGORY IV (EC-IV)

- USED TO ASSESS EMERGENCY PLANNING AS DESCRIBED LATER.
- INCLUDES EVENTS WITH A FREQUENCY DOWN TO APPROXIMATELY 10^{-9}/YR.
- INCLUDED IN PRA ANALYSIS.

IN ANALYZING EVENTS FROM THE ABOVE CATEGORIES A DETERMINATION MUST BE MADE REGARDING APPLICATION TO ONE OR MULTI-MODULES.

Selection of Bounding Events

- Use engineering judgement to deterministically impose a set of plant states and failures which bound uncertainties in event frequency and failure modes. Include bounding events in the following categories:

    - Reactivity insertion
    - Decay heat removal
    - Chemical reactions
    - Loss of coolant inventory/flow
    - Supporting systems
    - External events

- Considerations used in selecting bounding events are:

    - Non-safety grade equipment fails in worst way
    - Safety grade equipment fails for a period of time consistent with previous experience/reasonable recovery time.
    - Human errors consistent with previous experience

- Bounding events for each design will be described in staff SERs.

EXAMPLE BOUNDING EVENTS

CATEGORY	BOUNDING EVENT
REACTIVITY INSERTION	INADVERTENT WITHDRAWAL OF ALL CONTROL RODS FOR "X" HOURS (ONE MODULE)
DECAY HEAT REMOVAL	LOSS OF ALL DECAY HEAT REMOVAL* FOR "X" HOURS (ONE MODULE)
CHEMICAL REACTION	S.G. TUBE RUPTURE ("X"% OF TUBES)* (ONE MODULE)
LOSS OF COOLANT INVENTORY/FLOW	RV LEAK/PIPE RUPTURE/PRIMARY PUMP SEIZURE (LMRs) (ONE MODULE)
SUPPORTING SYSTEMS	STATION BLACKOUT FOR "X" HOURS (ALL MODULES)
EXTERNAL EVENTS	CONSISTENT WITH WHAT IS TO BE DONE FOR FUTURE LWRs.

* FOR THE MHTGR WOULD INCLUDE PRESSURIZED AND DEPRESSURIZED STATES.

SITING SOURCE TERM AND USE

- TO ALLOW THE USE OF MECHANISTIC ANALYSIS FOR SITING SOURCE TERM SELECTION, THE FOLLOWING RELEASE LIMITS WOULD APPLY FOR SITING DETERMINATIONS:

EVENT CATEGORY	DOSE GUIDELINES	METEOROLOGY
EC-II	10% OF 10CFR100	CONSERVATIVE
EC-III	10CFR100	CONSERVATIVE

- ENSURE NONE OF THE EC-II AND EC-III EVENTS ARE ON A THRESHOLD WHERE A SLIGHT CHANGE IN ASSUMPTIONS CAN CAUSE AN UNACCEPTABLE CHANGE IN SOURCE.

Adequacy of Containment

- A design must meet the following containment criteria:

    - Provide multiple barriers to radiation release which meet the release guidelines for event categories I through III as discussed earlier.
    - Demonstrate via testing the above releases are achievable.
    - Provide additional or enhanced QA, surveillance, in-service inspection/testing, as necessary, to ensure that the systems, structures and components which contribute to performing the containment function are, in fact, capable of performing their function over the life of the plant.
    - Provide protection of safety related systems, structures and components from sabotage and external events equivalent to that for LWRs.
    - Eliminate core melt, significant positive reactivity feedback or other accidents with the potential of a large radiation release from the EC-I, II and III categories.

- For designs without a conventional containment building, an assessment of the potential improvement in safety of adding a containment building would have to be made. Judgement would then be used to determine need for a containment building based upon cost and change of risk.

ADEQUACY OF OFFSITE EMERGENCY PLANNING

TRADITIONAL OFFSITE EMERGENCY PLANNING (OTHER THAN NOTIFICATION) COULD BE ELIMINATED PROVIDED THE FOLLOWING ARE MET:

- THE LOWER LEVEL PAGS ARE NOT EXCEEDED AT THE SITE BOUNDARY DURING THE FIRST 36 HOURS FOLLOWING ANY EVENT IN CATEGORIES EC-I, II AND III.
- A PRA ANALYSIS, WHICH INCLUDES EVENTS IN AT LEAST CATEGORIES EC-I THROUGH IV, INDICATES THAT THE CUMULATIVE FREQUENCY OF EXCEEDING THE LOWER LEVEL PAGS AT THE SITE BOUNDARY WITHIN THE FIRST 36 HOURS DOES NOT EXCEED APPROXIMATELY 10^{-6}/YR.

POLICY QUESTIONS RELATED TO STAFF PROPOSAL

1) ARE THE RANGE AND SELECTION OF ACCIDENTS IN EC-I THROUGH IV ACCEPTABLE FOR USE IN EVALUATING SITING SOURCE TERM, CONTAINMENT AND EMERGENCY PLANNING?

2) IS IT ACCEPTABLE TO SELECT AND USE A SITING SOURCE TERM USING MECHANISTIC ANALYSIS AND THE DOSE GUIDELINES PROPOSED BY THE STAFF, IN LIEU OF THE MORE MECHANISTIC 10CFR100 (TID-14844) APPROACH?

3) IS A REACTOR DESIGN WITHOUT A CONVENTIONAL CONTAINMENT BUILDING ACCEPTABLE, PROVIDED THE STAFF PROPOSED CRITERIA ARE MET?

4) IS THE ELIMINATION OF TRADITIONAL OFFSITE EMERGENCY PLANNING ACCEPTABLE, PROVIDED THERE IS SUFFICIENT TIME FOR CONDUCTING "AD HOC" EVACUATION FOR EVENTS IN EC-I THROUGH III?

5) IS "DEFENSE IN DEPTH" ADEQUATELY MAINTAINED?

Application of Criteria

Conceptual Design Stage

- Criteria developed, endorsed by the Commission and provided to designers as guidance
- Staff review of conceptual designs assesses potential of the designs to meet the criteria and assesses enhanced safety. Results documented in SERs.

Preliminary/Final Design Stage

- Staff proceeds to formally implement criteria via rulemaking
- Staff reviews preliminary/final designs for compliance with criteria, with due consideration of impact of having more design detail and supporting R & D available (i.e. reconsider design specific aspects/conservatisms)

Design Certification

- Staff certifies design in compliance with criteria via rulemaking

PEER REVIEW OF KEY ISSUES

- PEER REVIEW TEAM
  - R. MATTSON
  - R. BUDNITZ
  - J. HENDRIE

- REQUESTED TO REVIEW STAFF PROPOSED APPROACH TO THE RESOLUTION OF THE FOUR KEY ISSUES.

- REVIEWED DRAFT COMMISSION PAPER AND STAFF PRESENTATIONS ON THIS SUBJECT.

- LETTER REPORTS RECEIVED IN EARLY JANUARY 1988.

OPERATING EXPERIENCE FEEDBACK ON MAIN FEEDWATER FLOW CONTROL AND BYPASS VALVES

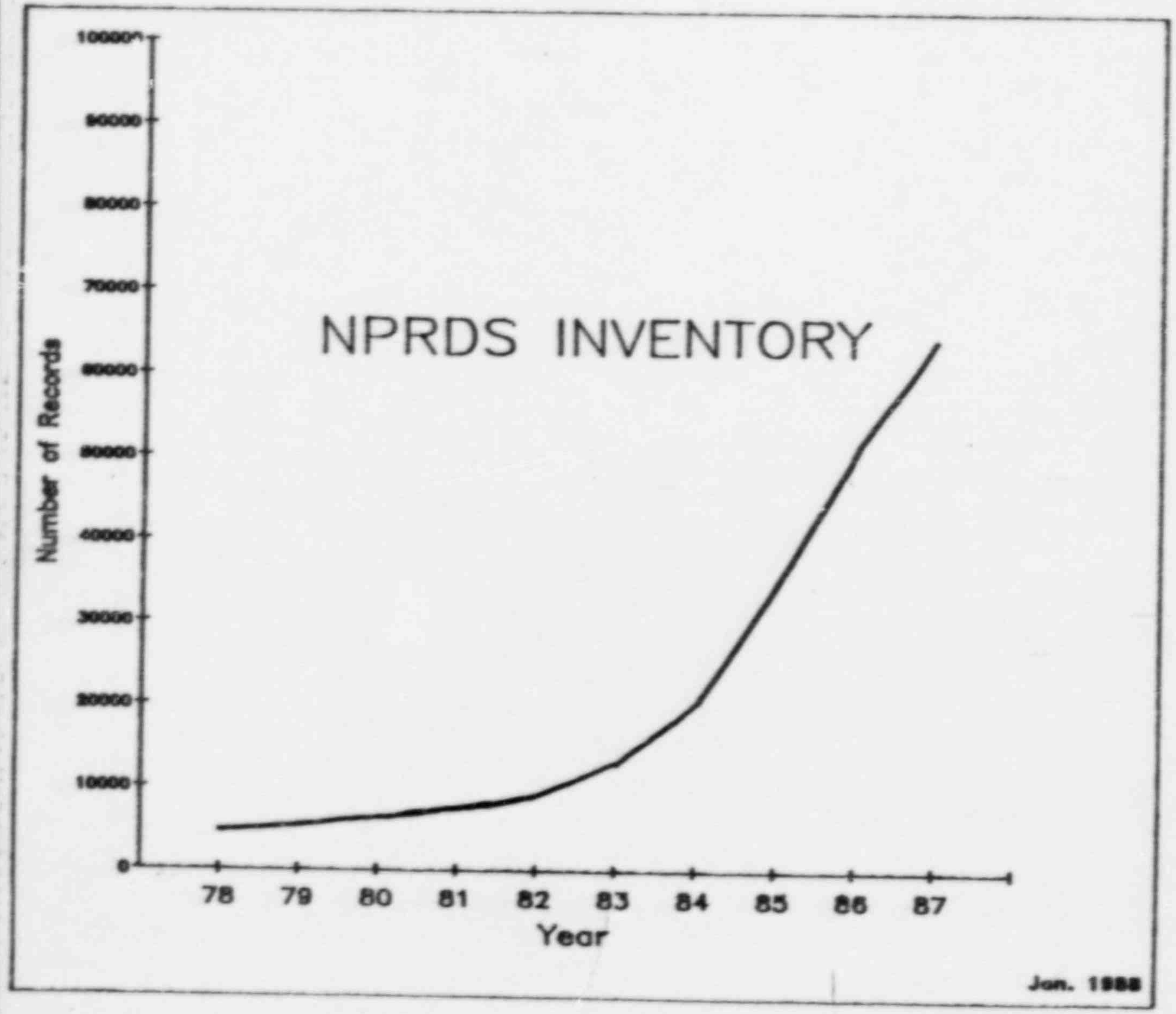
BRIEFING FOR

THE ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

FEBRUARY 12, 1988

OPERATING EXPERIENCE FEEDBACK ON MAIN FEEDWATER FLOW CONTROL AND BYPASS VALVES

- BACKGROUND
  - INTEREST IN BOP CAUSED SCRAMS
  - 1986 STATISTICS -- 60% BOP
27% FEEDWATER (ALL SOURCES)
10% HARDWARE IN FRV OR PUMPS
- DATA SOURCE (NPRDS)
  - GROWTH IN NPRDS DATA
  - SEMIANNUAL MONITORING
- NPRDS INSIGHTS
  - ENGINEERING DATA
  - FAILURE REPORTS
- FOCUSED STUDIES
  - FEEDWATER REGULATING AND BYPASS VALVES
  - MAIN FEED PUMPS (MOTOR AND TURBINE DRIVEN)


NPRDS INVENTORY
Number of Records
100000
90000
80000
70000
60000
50000
40000
30000
20000
10000
0
78
79
80
81
82
83
84
85
86
87
Year
Jan. 1988

AEOD TRENDS AND PATTERNS ANALYSIS REPORT -

OPERATIONAL EXPERIENCE FEEDBACK ON MAIN FEEDWATER

FLOW CONTROL AND MAIN FEEDWATER FLOW BYPASS

VALVES AND VALVE OPERATORS (AEOD P701)

G.L. PLUMLEE III

- REPORT PURPOSE - GOOD PRACTICE DOCUMENT
  - PROVIDE OPERATIONAL FEEDBACK
- SCOPE
  - JANUARY 1984 THROUGH OCTOBER 1985 FAILURES
  - NPRDS DATA ANALYZED
  - PWR MFW FLOW CONTROL VALVES EVALUATED
- DATA ANALYSIS METHODOLOGY
  - TIME BETWEEN FAILURES VS. COMPONENT VARIABLES
  - ENGINEERING EVALUATION OF RESULTS
  - CONTACTS WITH LICENSEES, VALVE MANUFACTURERS

- COUNTS FOR COMPLETED TREND AND PATTERN ANALYSIS STUDY

	MFWCV			MFWBV		
	ENGR RECORDS	FAILURES	UNITS	ENGR RECORDS	FAILURES	UNITS
TOTAL	121	107	42	101	52	36
OUTLIER (UNITS)	25	78	10	15	34	6
OUTLIER FAILURE DISTRIBUTION						
VALVE		24			17	
VALVE OPERATOR		54			17	

- NPRDS REPORTED PROBLEMS/CORRECTIVE ACTION

	MFWCV	MFWBV
VALVE		
PACKING-BONNET/FLANGE	12	13
VALVE INTERNALS	13	9
OPERATOR		
ADJUSTMENT/CALIBRATION	25	5
PIECE PART REPLACEMENT	17	8
PIECE PART REPAIR/CLEAN	15	4

FINDINGS

- UNIT/STATION DIFFERENCES HAD GREATEST INFLUENCE

- MAJOR CAUSES OF MFW FLOW CONTROL VALVE FAILURES:

  - VIBRATION
  - DEGRADED INSTRUMENT AIR
  - INADEQUATE MAINTENANCE PROCEDURES
  - IMPROPER VALVE OR VALVE INTERNALS
  - INADEQUATE WEATHER TIGHTNESS

- FAILURE MODES ARE ATTRIBUTED TO:

  - POOR MAINTENANCE PRACTICES

  - VALVE OPERATOR ABILITY TO WITHSTAND ENVIRONMENTAL VIBRATION (PUMPS AND FLOW THROUGH VALVES)

  - VALVE OPERATOR INABILITY TO FUNCTION DUE TO POOR QUALITY INSTRUMENT AIR

  - VALVE OPERATOR ADJUSTMENT SENSITIVITY

  - VALVE PACKING LIFETIME/MAINTENANCE FREQUENCY

  - VALVE TRIM (PLUG AND CAGE OR SEAT) LIFETIMES

ACTIONS TO PREVENT PROBLEMS

PROBLEM	CAUSE	ACTIONS TO PREVENT PROBLEMS
VALVE OPERATOR FAILURE	SYSTEM OR VALVE-INDUCED VIBRATION	USE FLEXIBLE STAINLESS STEEL INSTRUMENT AIR LINES. USE VIBRATION-RESISTANT CONNECTORS AND FASTENERS (ESPECIALLY FOR THE SOLENOID VALVES).
VALVE OPERATOR FAILURE	OIL, MOISTURE AND/OR RUST, OR FOREIGN PARTICLES IN THE INSTRUMENT AIR SYSTEM	UPGRADE THE INSTRUMENT AIR SYSTEM WITH IMPROVED DRYERS. MONITOR INSTRUMENT AIR QUALITY AND ESTABLISH MAINTENANCE SCHEDULES ALLOWING PROMPT CORRECTIVE ACTION.
VALVE OPERATOR FAILURE	OUTDOOR WEATHER CONDITIONS	USE WATER PROOF SOLENOIDS.

PROBLEM	CAUSE	ACTIONS TO PREVENT PROBLEMS
VALVE AND VALVE OPERATOR FAILURES	POOR MAINTENANCE PROCEDURES	USE DETAILED MAINTENANCE PROCEDURES THAT ASSURE THE COMPLETION OF PROPER MAINTENANCE AND ADJUSTMENTS BEFORE SYSTEM STARTUP.
		PROVIDE ADEQUATE TRAINING AND SUPPORT OF THE MAINTENANCE PERSONNEL.
		CONSULT WITH VALVE MANUFACTURERS TO ESTABLISH EFFICIENT ROUTINE MAINTENANCE SCHEDULES.
		HAVE VALVE MANUFACTURERS REFURBISH THE VALVE TRIM INSTEAD OF DOING THIS IN-HOUSE.
		COVER OPEN PIPES AND DISASSEMBLED VALVES DURING MAINTENANCE.

PROBLEM	CAUSE	ACTIONS TO PREVENT PROBLEMS
VALVE RELEASED LEAKAGE	PACKING LEAKS	USE NEW PACKING MATERIALS WITH LOW SHRINKAGE AND DESIGNS THAT MAINTAIN CONSTANT PRESSURE ON THE PACKING (SPRING-LOADED, FOR EXAMPLE).
	BONNET/FLANGE	IN MAINTENANCE, CAREFULLY INSPECT THE FLANGE BEFORE REASSEMBLY.
VALVE CONTAINED LEAKAGE	IMPROPERLY ADJUSTED VALVE OPERATORS	USE IMPROVED, VALVE-SPECIFIC MAINTENANCE PROCEDURES.
	DAMAGED VALVE TRIM (PLUG AND CAGE OR SEATS)	USE PROPER MAINTENANCE. CONSULT VALVE MANUFACTURERS FOR ADVICE ON IMPROVED VALVE TRIM DESIGNS AND MATERIALS FOR ACTUAL PLANT CONDITIONS SUCH AS HIGHER PRESSURE DROPS.

- CONCLUSIONS
  - PROPER MAINTENANCE/APPROPRIATE SUBCOMPONENTS AVOID PROBLEMS
  - SYSTEM UPGRADES MAKE THE MFW SYSTEM MORE RELIABLE
  - GOOD PRACTICE DOCUMENT

- STAFF FOLLOWUP
  - STUDY PROVIDED TO NRR FOR USE IN BOP INSPECTIONS
  - ISSUE STUDY REPORT TO LICENSEES

IMPACT OF NUCLEAR WASTE POLICY AMENDMENTS ACT OF 1987 ON NRC HLW PROGRAM

MICHAEL BELL, DEPUTY DIRECTOR
DIVISION OF HIGH-LEVEL WASTE MANAGEMENT

FEBRUARY 12, 1987

NWPAA PROVISIONS AFFECTING NRC HLW PROGRAM

- CHARACTERIZE ONLY ONE SITE FOR FIRST REPOSITORY(NEVADA)
- POSTPONE SECOND REPOSITORY UNTIL 21ST CENTURY
- ANNULS DOE'S PROPOSAL TO CONSTRUCT MRS AT CLINCH RIVER
  - AUTHORIZES MRS FACILITY
  - ESTABLISHES MRS REVIEW COMMISSION
  - REQUIRES NEW SITE SELECTION PROCESS
  - TIES MRS SCHEDULE TO REPOSITORY SCHEDULE
- PROVIDES FOR BENEFITS AGREEMENT WITH HOST STATE OR INDIAN TRIBE FOR BOTH REPOSITORY AND MRS
  - BENEFITS REDUCED FROM EARLIER BILL
  - PROVIDES FOR LOCAL GOVERNMENT PARTICIPATION
  - ESTABLISHES REVIEW PANEL
- ESTABLISHES OFFICE OF NUCLEAR WASTE NEGOTIATOR
- ESTABLISHES NUCLEAR WASTE TECHNICAL REVIEW BOARD
- ESTABLISHES OFFICE OF SUBSEABED DISPOSAL RESEARCH
- REQUIRES NRC CERTIFICATION OF DOE SHIPPING CASKS

ENCLOSURE

PLAN TO IMPLEMENT RECENT LEGISLATION

- O CONTINUE PROGRAM TO PREPARE TO COMPLETE CONSTRUCTION APPLICATION REVIEW IN THREE YEARS
- O CONTINUE SITE-SPECIFIC REVIEWS OF DOE SUBMITTALS FOR NEVADA SITE:
  - DRAFT SITE CHARACTERIZATION PLAN IN FY 1988
  - FINAL SITE CHARACTERIZATION PLAN IN FY 1989
- O TERMINATE SITE-SPECIFIC ACTIVITIES FOR TEXAS AND WASHINGTON SITES:
  - DO NOT INITIATE DRAFT CONSULTATION SCP REVIEWS
  - ELIMINATE REPRESENTATIVE AT WASHINGTON SITE
  - ELIMINATE PROJECT MANAGERS
  - TERMINATE TECHNICAL ASSISTANCE AND RESEARCH DIRECTED AT TEXAS OR WASHINGTON SITES*
- O REALLOCATE RESOURCES BACK TO PRIORITY PROGRAMS BY REASSIGNING/DETAILING STAFF:
  - 5 FTEs TO NUCLEAR MATERIAL SAFETY
  - 4 FTEs TO LOW LEVEL WASTE MANAGEMENT
  - 1 FTE TO NUCLEAR MATERIAL SAFEGUARDS AND TRANSPORTATION
- O ADJUST NRC REGULATORY DEVELOPMENT AND LICENSE REVIEWS SCHEDULES, AS APPROPRIATE, BASED ON REVISED DOE PLANS (WHEN AVAILABLE)
- O ADJUST FY 1989 - 1993 PROGRAMS AND RESOURCES, AS APPROPRIATE, DURING 1988 UPDATE OF NRC FIVE-YEAR PLAN TO SUPPORT DOE PLANS

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*Funds are being reduced as part of the $35M Congressional reduction for FY 1988.

NRC HIGH-LEVEL WASTE MANAGEMENT RESOURCES

FY85		FY86		FY87		FY88			
Budgeted 1/		Budgeted 1/		Budgeted 1/		Budgeted 1/		Current Estimate	
FTE	$K	FTE	$K	FTE	$K	FTE	$K	FTE	$K
97	7,770	116	6,745	105	7,575	88	7,435	67 2/	5,360

1/ President's Budget.
2/ Reflects reprogramming of 21 direct FTEs during formulation of the FY89 budget.
3/ Tentative OMB Mark.