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UNITED STATES NUCLEAR REGULATORY COMMISSION'S

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

DATE: Friday, October 5, 1990

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

366TH ACRS GENERAL MEETING

Nuclear Regulatory Commission

Room P-110

7920 Norfolk Avenue

Bethesda, Maryland

Friday, October 5, 1990

The above-entitled proceedings commenced at 10:45 o'clock a.m., pursuant to notice, Carlyle Michelson, Committee Chairman, presiding.

PRESENT FOR THE ACRS SUBCOMMITTEE:

Charles J. Wylie, Vice Chairman

James. C. Carroll, Member

Ivan Catton, Member

William Kerr, Member

Harold W. Lewis, Member

Paul G. Shewmon, Member

Chester P. Siess, Member

David A. Ward, Member

PRESENT FOR THE ACRS SUBCOMMITTEE: [cont.]

J. Ernest Wilkins, Jr., Member

PARTICIPANTS:

R. Fraley	E. McKenna
J. Roe	J. Spraul
F. Allenspach	B. Sheron
J. Richardson	C. Serpan

PROCEEDINGS

[10:45 a.m.]

MR. MICHELSON: Gentlemen, the next item on the agenda is performance-based quality assurance, and I believe that's Chet Siess. Chet, if you will.

MR. SIESS: There is some material in Tab 11, and really what we are doing today is staff is going to give us a rundown on what they have done recently in a new version of the standard review plan that covers the review of an applicant's quality assurance program. I don't think we need much preliminary from me.

In Tab 11 there is a copy of new Chapter 17.3 from the standard review plan, and there's a couple of pages of status report from A1. You don't have the old 17.1 and 17.2 --this is just the new 17.3 which is intended to replace that. If you wanted to make detailed comparisons of the 17.3 with 17.2, I have the package on that, that has all the comparisons in it.

Eileen, are you going to start it off?

MS. McKENNA: Yes.

MR. SIESS: Eileen McKenna will present this. How come we have a cover sheet here of all the phone numbers and stuff and we don't have your name on it?

MS. McKENNA: I'm not really going to be making the presentation, I just want to introduce the speakers.

MR. SIESS: I see, okay. So, I will turn it over to you to introduce whoever is going to be making the presentation.

MS. McKENNA: Thank you. My name is Eileen McKenna, I am the acting Branch Chief of the Performance and Quality Evaluation Branch in the Office of Nuclear Reactor Regulation. We are here this morning to talk about performance-based quality assurance. Mr. Jack Spraul, who is the Quality Operations Engineer in the Branch, will be making the bulk of the presentation. I have also asked Mr. Fred Allenspach, who is a Senior Operations Engineer in the Branch, to give a little bit of information on where we are going with some tech spec issues that are related to this area, and he will follow Jack's presentation.

With that, I would like to turn things over to Jack Spraul.

MR. SIESS: Before you start, you are a quality operations engineer?

MR. SPRAUL: Yes, sir.

MR. SIESS: That means you deal with operations of operations or quality for operating plants, or none of the above?

MR. SPRAUL: Yes, all of the above. My principal function is to come out with the guidance like this 17.3 for the review of Q/A program descriptions that are submitted by

operating licensees, licensees of operating plants, NSSS and architect/engineers and so forth, and reviewing what is submitted in response to that.

MR. SIESS: Who does the reviewing? Are you a reviewer too?

MR. SPRAUL: We do the reviewing in headquarters for new applications. Once a program has been approved, changes are reviewed by the region.

MR. SIESS: In both cases, using Chapter 17.

MR. SPRAUL: Yes, sir. That is the acceptance criteria.

MR. SIESS: What you have now in 17.3 is your guidance for new programs but if somebody out in the field licensed was originally reviewed under 17.1 or 2, if they made changes they would be reviewed in the region?

MR. SPRAUL: They would be reviewed against the same acceptance criteria that they had been reviewed against, 17.1 and 17.2.

MR. CARROLL: Unless they wanted to --

MR. SPRAUL: Unless they want to update to 17.3, and then we would --

MR. SIESS: In which case, would you review it or would the region review it?

MR. SPRAUL: Initially, I suspect it would be done in headquarters.

MR. SIESS: Okay, why don't you go ahead. We will have some more questions about how it operates, I am sure.

MR. SPRAUL: Basically I see our purpose here today is to bring the ACRS up-to-date on where we stand with performance-based quality assurance. Dr. Siess requested some background information regarding our requirements and our guidelines for the nuclear industry, so the next couple of slides I will get into that.

[Slide.]

Our requirements come from 10 CFR Part 50, Appendix B, Quality Assurance Criteria for nuclear plants and fuel reprocessing plants. That is the 18 criteria I suspect you are all familiar with, and it covers such things as organizations, design control, procurement control, document control, inspections, test control, non-conformances, corrective actions, records, audits. Those are the 18 criteria.

[Slide.]

With that being the requirement then, the guidance is published. Basically it starts with our standard review plan. Section 17.1 covers design and construction, and it references these regulatory guides. These guides cover areas of the Q/A program, and these guides reference the N-45.2, ANSI standard and its daughter standards as shown there.

MR. SIESS: Who wrote the N-45?

MR. SPRAUL: The N-45.2 comes from the Q/A Committee of ASME.

MR. SIESS: ASME and QA.

MR. SPRAUL: Nuclear Quality Assurance Committee. They come through that avenue up through ANSI and are published.

MR. SIESS: Okay.

MR. SPRAUL: That is what 17.1 says. We will get into 17.3 in a good bit of detail later, but it is not specifically for design and construction. It is a general acceptance criteria. Reg Guide 128, Rev. 3 now references NQA-1. NQA-1 has taken N-45.2 and these daughter standards and incorporated it into one standard.

MR. SHEWMON: Is 17-3 a different chapter of 17, or is it a later version of a 17.1?

MR. SPRAUL: Chapter 17 now includes Section 17.1, 2 and 3. My initial desire was to get rid of 17.1 and 2 and just have a new Chapter 17. However, since we are still using Section 17.1, 17.2 to review ongoing work, they stay in there and 17.3 follows.

MR. SIESS: The 17.3 is an alternate to 1 and 2.

MR. SPRAUL: Yes.

MR. SIESS: They do not all apply?

MR. SPRAUL: No.

MR. SIESS: It's either 1 and 2 or three.

MR. SPRAUL: That's right.

MR. CARROLL: Or 1 or 2.

MR. WILKINS: Is it conceivable say 15 years from now when you will have worked through all the backlog with 17.1 and 2 that you could consider deleting them? I don't know why I said 15 years.

MR. SPRAUL: I doubt it, because for their 40 year life if someone is licensed to 17.1 and 2, 17.2 for operations, we are not requiring that they go to 17.3.

MR. SIESS: If everybody converted to the 17.3, then you could abolish 17.1.

MR. SPRAUL: Yes.

MR. SIESS: But anybody that wanted to stay with 17. 1 or 2 you could, so you have to leave it.

MR. SPRAUL: Yes.

MR. SIESS: You don't have to. The standard review plan is not a legal requirement.

MR. SHEWMON: With a life extension they could stay on for another 20 years.

MR. SPRAUL: Perhaps, yes.

MR. SIESS: NQA-1 is put out by the NQA Committee; it's a new standard.

MR. SPRAUL: Yes, sir.

MR. SIESS: It is actually different from the N-

45, or is it just collective.

MR. SPRAUL: It has some differences in. Those were taken into account when we put out Reg Guide 1.2 and 28 Rev 3. The differences were taken into account with the regulatory positions of Reg Guide 1.28, Rev 3 to bring it to what we felt was at least as good as the daughter standard.

MR. SIESS: NQA-1 is officially accepted.

MR. SPRAUL: NQA-1 is endorsed by Rev 3 of Reg Guide 1.28, yes, sir.

MR. SIESS: It is an ANSI standard, did it go through the ANSI process?

MR. SPRAUL: I believe so, yes.

MR. SIESS: We always refer to ANSI N-45 but NQA - - the number change.

MR. SPRAUL: I don't know. I would have to look at the title and see.

MR. SIESS: Okay, go ahead.

MR. CARROLL: Just for perspective, 17.3 is just recently out on the street, right?

MR. SPRAUL: Yes, sir.

MR. SIESS: It has been approved, incidentally.

MR. SPRAUL: Yes.

MR. SIESS: There is no action required by us.

MR. SPRAUL: Yes, it is out on the street.

MR. SIESS: It got through CRGR.

MR. SPRAUL: The research people are in the process of revising 128, and eventually it will come out endorsing NQA-2. NQA-2 has taken these standards and combined them into a single document. NQA-1 is more the programmatic type of standards, NQA-2 are more the technical type of quality assurance standards.

In addition to taking those standards and putting them into NQA-2 as we live and learn, NQA-2 has also added standards for Q/A of computer software, Q/A of hoisting, rigging and transporting, Q/A of calibration and control of measuring and test equipment, and Q/A of subsurface investigations. So that, if we do get -- if utilities and others do upgrade their Q/A program to 17.3 and incorporate a commitment to NQA-2, they will be committing to something beyond what is in these daughter standards.

[Slide.]

The next slide shows it similar to what we have there now, but we are talking about operations; 17.2 is for operations. It has been used for years. 17.2 endorses ANSI Reg Guide 1.33 for the programmatic portion, and the same programmatic portion in N-45.2 and the daughter standards have been incorporated into ANS-3.2.

For activities during the operations phase that are comparable to those during the construction phase, it

references back to these reg guides and ANSI standards. Again, when we get into 17.3, we will talk about that some more. That's the regulations and requirements and guidance that is out there on the street.

MR. SIESS: As far as the actual reference standards are concerned, they are unchanged by going to 17.3 by 17.1 or 17.2?

MR. SPRAUL: By going to 17.3, we will be looking for commitments to the latest revisions of NQA-1 and NQA-2 and ANS-3.2.

MR. SIESS: That wouldn't be any different than what is on the left?

MR. SPRAUL: There are some differences. We feel there have been improvements. The Committee that puts out standards has seen where there can be improvements in the standards, and they are upgraded somewhat from a Q/A point of view. Basically, they are the same.

MR. SIESS: In terms of performance versus programmatic, those items are not changed.

MR. SPRAUL: That's correct.

[Slide.]

This performance-based concept all started back in 1984 when the Congress requested a study which was reported in the Ford Report, NUREG-1055 called the Improving Quality and the Assurance of Quality in the Design and Construction

of Nuclear Power Plants. The basic finding of that report was that there was inadequate implementation of Appendix B because of over-emphasis on form; that is, program development, program documentation, at the expense of substance. That is, program implementation and effectiveness.

The staff felt that the findings were also applicable to operations.

MR. KERR: Excuse me. Who made that finding?

MR. SPRAUL: Dr. Altman was the team leader of the team that put that report together, the Ford Report.

MR. KERR: This was an NRC team?

MR. SPRAUL: NRC staff, yes, with consultants.

MR. CARROLL: How does it get the name of Ford?

MR. SPRAUL: I think he was the instigator in Congress that requested the study.

Since then in 1987, there was a position paper put out, SECY-87220 called Assurance of Quality. That was put out by the staff and informed the Commission of the staff's shift in emphasis from compliance-based inspections of licensee, Q/A, Quality Verification to performance oriented inspections of these organizations. Performance oriented or performance-based activities then are activities that focus more on the effectiveness of what is done and less on the related documentation. NRC performance-based emphasis is on

activities important to the safe and reliable plant operations.

[Slide.]

To implement what was said in that position paper, we have developed performance-based Q/A training. There was a pilot session in 1987 of a course called inspecting for performance. In March of 1988 there was issued a NUREG-5151, called Performance-based inspections based on the course. As indicated in that NUREG, the goal of performance-based inspections is to improve the inspector's ability to accurately evaluate the plant safety.

It has developed now into a two and one-half day course, it is part of the technical training center curriculum. I have a flyer available, if anyone would like to see it. There are three more sessions that are scheduled for fiscal year 1991. The next course is in Region 1 next week, October 10 through 12.

Of the 489 personnel that have taken that, there has been one person from IAEA, eight people from four different state agencies, four people from the Navy Department of Radiation Safety, and the remainder from NRC.

MR. SIESS: What parts of NRC?

MR. SPRAUL: From the Regions, both resident and other inspectors, and basically NRR.

MR. SIESS: Most of them from the regions?

MR. SPRAUL: Yes.

MR. SIESS: Because NRR doesn't do much inspecting.

MR. SPRAUL: Well, they do some.

MR. SIESS: With what, teams that go out?

MR. SPRAUL: Basically as teams, yes. Basically participating in team inspections and so forth, that's right.

MR. CARROLL: We are now getting the project managers as part of routine inspections.

MR. SPRAUL: There have been project managers to take the course; how many, I don't have it broken down that far.

Within industry then there has been a course that is modeled after the NRC course. That is being taught within the Nuclear industry. It has been taught in all five regions, and it covers personnel from about 50 plants. Some plants have found as a result of seeing what is being taught in that course that they needed to change their tech specs to allow variations in audit schedules based on performance indicators so that the audit schedules are more performance-based.

Standard tech specs require audits of this every six months, of this every six months, of this every year.

To become performance-based, you want to go to the items where there have been problems that are important to safety rather than stick to a hard line schedule like that. So, that has taken place. There has been some interest in this commercial course from some foreign countries, although it hasn't been presented to my knowledge as of yet.

MR. WYLIE: Let me ask a question about that slide. You say about 50 utilities -- it has been presented to about 50 utilities?

MR. SPRAUL: Thirty utilities who operate 50 plants, operating plants.

MR. WYLIE: The 50 plants are encompassed by those 30 utilities?

MR. SPRAUL: Yes.

MR. WYLIE: Not more than that.

MR. SPRAUL: No.

MR. SIESS: This is a training, and who operates the industry training program?

MR. SPRAUL: The instructor is a consultant by the name of John Johnson.

MR. SIESS: Is it INPO?

MR. SPRAUL: No.

MR. SIESS: He just goes around from industry to industry, or is he provided by NRC? I am confused.

MR. SPRAUL: If industry wants the course taught

we refer them to him. As a consultant, I guess he does his own advertising.

MR. SIESS: I see, okay. Who on the utility or the plant staff would attend these training courses?

MR. SPRAUL: I suspect it's principally the inspectors of the utility, maybe with their first line management or something like that.

[Slide.]

We have also had some inspection procedure revisions. IP 35702 was initially issued as a temporary instruction in January of 1978. Under that temporary instruction, NRR conducted a series of inspections with regional staff which increased the regional inspector's emphasis on the actual observation of ongoing work and reduced the emphasis on document and program reviews.

By focusing attention on activities that are important to safe and reliable plant operations, these inspections were a model that successfully encouraged licensee's verification and oversight organizations to conduct themselves similarly.

MR. KERR: Excuse me. When you talk about observing these activities, were these activities of people who were operating the plant or activities of Q/A people?

MR. SPRAUL: Activities of people operating the plant as well as --

MR. KERR: In a sense --

MR. SPRAUL: As the Q/A people were doing a summary finding.

MR. KERR: The Q/A people become part of management because they are also observing the same sorts of things that management would observe; is that right?

MR. SPRAUL: Within limits. The utilities picked up and tended to manage and operate their facilities in a more performance-based manner because they pick up the philosophy of inspection that the NRC uses, and they tend to inspect the way the NRC does it. They don't want the NRC to come in and do something different from what they have done to see if it's okay when the NRC looks at it.

MR. KERR: However, you say the utilities had not been previously operating on a performance-based manner and they now started?

MR. SPRAUL: We feel that they are becoming more performance-based. It varies from utility to utility.

MR. KERR: Are you talking about the total operation or the Q/A part of it?

MR. SPRAUL: The total part of it, the whole program.

MR. KERR: The utilities, before Q/A programs, had not been operating in a performance-based manner.

MR. SIESS: Performance-based Q/A. There is still

a distinction between Q/A and quality.

MR. KERR: But I asked him which he meant, and he said that he's not talking about the Q/A program he is talking about the utility operational program, that it has become more performance-based.

MR. SPRAUL: Well, the performance-base -- the people who are doing the work are doing the work, okay? And then you have the quality control, quality assurance, the other people who are -- and management, who are looking to see that the work is being done. The performance-based part of it is basically the oversight effort that has been done by the quality verifiers, the quality assurance, quality control people.

MR. KERR: Thank you.

MR. SIESS: A quality verifier is different say from a quality control inspector?

MR. SPRAUL: Not necessarily. I think a quality verifier encompasses -- an auditor is a quality verifier.

MR. SIESS: An auditor is a quality verifier?

MR. SPRAUL: Sir?

MR. SIESS: The auditor is a quality verifier?

MR. SPRAUL: Yes, sir.

MR. SIESS: Is he verifying the quality of the work or the quality of the program?

MR. SPRAUL: Both.

MR. SIESS: They are not necessarily the same.

MR. SPRAUL: I agree.

MR. SIESS: You can have an awfully good program that you don't follow.

MR. SPRAUL: That's been a problem.

MR. SIESS: That's what I thought performance meant, you look at the quality of the work.

MR. SPRAUL: Yes.

MR. SIESS: What you have up here, I am trying to relate this back to the design construction operation categories. Is this mostly for operations? It says LWR Inspection Program for Operations.

MR. SPRAUL: That's a manual chapter, and it is specifically written for operations.

MR. SIESS: What does operations mean, anything that goes on in an operating plant?

MR. SPRAUL: During the operations phase.

MR. SIESS: What is an operations phase, a plant is built --

MR. SPRAUL: Once a plant is licensed. It has its operating license, and then it is in the operations phase.

MR. SIESS: If I am going to replace piping in a plant or replace steam generators or something else, I have a bunch of engineers that have to do some designs, make some plans. Then I have a bunch of people that have to come in

and build it.

MR. SPRAUL: Yes, sir.

MR. SIESS: Those normally would be called design and construction. But once the plant is operating, that is now called operations?

MR. SPRAUL: That's the operations phase, and that's an activity of modification or maintenance activity that can be comparable in scope to the kind of work that was done during the construction phase, but that is covered under the plants, the utilities, the licensee, operational Q/A program. It covers into that, yes.

MR. SIESS: That would be covered under 1.72 and not 17.1.

MR. SPRAUL: That's correct.

MR. SIESS: You would have a different quality program for design after the plant is operating than you would before it was operating -- that doesn't make sense to me.

MR. SPRAUL: The Q/A program description of the utility, it varies and the organization varies. During a design and construction phase a good portion of the licensee's quality assurance program is simply overseeing what is being done by his principal contractors.

MR. SIESS: Maybe, maybe not. He might be the principal designer. A couple of utilities that I know do

their own -- I couldn't care less whether Bechtel is doing it or Duke is doing it.

MR. SPRAUL: The responsibilities are different, because the ultimate responsibility is with the licensee.

MR. SIESS: I am not talking about responsibility. What I am trying to talk about is quality.

MR. SPRAUL: Yes, sir.

MR. SIESS: I want quality work, and I want the same quality work whether I am designing and building something in August of 1978 before I get a license or I am doing it in August of 1988 after I have had a license. Do the procedures actually differ, depending on whether or not I have an operating license -- I will give Jay a try here.

MR. CARROLL: As the original Chairman of the ANS-3 Standards Committee that wrote the operational phase Q/A program, we gave a lot of thought to this and decided that we should put design and construction kind of activities that would happen in the operational phase into that program. One of the reasons was that there is a difference. The Browns Ferry fire is a good example of it.

You want to have in your operational phase Q/A program, a way that people that are running the plant interface with construction for example and make sure you don't burn the plant down in the course of doing a construction activity.

MR. SIESS: There are those kind of differences between one and two?

MR. CARROLL: In the case of the utility that I used to work for, the Q/A program for the design engineering group isn't particularly different than it was during the original design phase. It has probably evolved and improved, but it is basically the same program. I think it is important to get the design and particularly construction guys to understand that it's a different ballgame once the plant is operating in terms of the freedom a construction organization has to tear into things or do whatever they do.

So, that's the philosophical sort of basis for including it in the operation.

MR. SIESS: That's really control of operations rather than control of quality, because you want the same quality no matter whether you build it -- before you design it before the plant is operating afterwards.

MR. CARROLL: Yes, but if you burn the plant down in the midst of construction you have impacted quality.

MR. SIESS: I think so.

MR. WYLIE: I think the quality assurance procedures are essentially the same.

MR. CARROLL: For the engineering organization.

MR. WYLIE: Yes.

MR. CARROLL: That's what I said.

MR. SPRAUL: Early this year EPRI issued a document entitled Guidelines for Performance-Based Supplier Audits. It is an ISEG document. This last June in Nashville, the ANS annual meeting had an entire session devoted to performance-based Q/A audits and surveillances. They are, I believe, following the lead of the Commission in that area.

[Slide.]

In 1988 the NRC's Light Water Reactor Inspection Program for plant operations -- that is manual chapter 25.15 was revised, and it now more clearly requires inspection of licensee performance in technical disciplines such as operations, maintenance, radiological controls, engineering, physical security and environmental protection.

The revision provides additional inspection guidance to follow up on operational events and safety issues, and to investigate the root causes and corrective actions related to identified concerns. With these changes, the NRC's inspection program for operations now provides greater flexibility in applying inspection resources to deal with issues of plant reliability and safety.

MR. SHEWMON: Sir, let me ask a specific question which would be one way to see if I understand what is happening or what's happening. Does this mean that the inspectors or the people doing this work will actually go

out and look at a piece of metal or component occasionally?

MR. SPRAUL: Yes.

MR. SHEWMON: There have been examples and were studies made of bolts, where if the paper was right they assumed the bolt was right, yet something like a hardness test would have shown that the bolt was wrong. Are things like that likely to happen?

MR. SPRAUL: I would say that tests like that are more likely to happen.

MR. SHEWMON: Under the current program?

MR. SPRAUL: Under the programs that are more performance-based, yes.

MR. SHEWMON: Whether or not it will then, depends on how it is implemented at a particular utility or this is a detail of some ANSI guide that you don't happen to have in your head?

MR. SPRAUL: If it is a requirement of an ANSI standard, I am not aware of it.

MR. SHEWMON: Okay. Which may mean that it hasn't been implemented. Thank you.

MR. CARROLL: I think Paul, because of the kind of problems that you are talking about, I guess it falls under the category of dedication of commercial products. I think most utilities are pretty sensitized to those kind of issues and are doing much better receipt inspections of material

than just looking at the piece of paper that says vendor X,Y,Z had provided you with what you ordered.

They are actually doing physical inspections of a lot of stuff in the industry today.

MR. SIESS: It would seem to me that what a utility does is going to be influenced to some extent by what the NRC does. If the NRC people only look at programmatic issues and only look at the paper, the utility is going to do the same thing or attempt to.

If NRC is going to go out and look at hardware and look at performance actually --

MR. CARROLL: And people performing work.

MR. SIESS: Yes, people performing work, then the utility I think, will do the same. Before, even if they wanted to, that wasn't where the emphasis was.

MR. SPRAUL: We are shifting our emphasis within the NRC.

MR. SIESS: Because the utility could be doing perfectly good work, but if their paper record was bad they have no credit for good work.

MR. KERR: Surely, they must have gotten some credit.

MR. SIESS: There are thousands of cases like that in licensing problems of allegations and allegations and allegations, that all ended up mounting to nothing but

allegations about paper, where if you went out and looked at the hardware it was fine. That put too much emphasis on the paper.

MR. WARD: It wasn't always fine, it was often indeterminate, was part of the problem.

MR. SIESS: Yes, but I can think of many cases of pipe supports, where nothing was wrong with the pipe support and it was something wrong with the piece of paper.

MR. SPRAUL: Now we will get into Standard Review Plan, Chapter 17. We have been talking about it a bit, but let me just go through and reiterate perhaps what I have said before.

[Slide.]

Acceptance criteria of standard review plan section 17.1 and 2 are program oriented. They are strictly right down in accordance with the 18 criteria of Appendix B, covering those same topics. In 17.3, what we have done is to make the acceptance criteria in a performance-oriented arrangement under the headings of management, performance and verification, and self-assessment.

[Slide.]

We believe that Section 17.3 leads to a more performance-based Q/A program description, performance-based commitments and, therefore, to the implementation of a more performance-based program.

MR. SIESS: Let me ask you -- it may be later, and if it is just tell me. There has been one requirement that I recall that the Q/A manager -- I will use that, the top person in Q/A -- had to have direct access to the very top level of management in the utility.

MR. SPRAUL: Yes, sir.

MR. SIESS: Is that an Appendix B requirement?

MR. SPRAUL: Appendix B says that he has to have access to people who can take care of the problems that his organization unearths.

MR. SIESS: That isn't changed?

MR. SPRAUL: That hasn't --

MR. SIESS: Appendix B isn't changed.

MR. SPRAUL: Appendix B is not changed.

MR. SIESS: That is really not a performance oriented statement, is it, defining hi access? What you really want is a Q/A manager that is able to produce quality to do those things that are necessary to have a quality program, have a quality plant, right?

MR. SPRAUL: That's true, but if he runs into a peer who is doesn't have the same goal then this alternative gives him a method of producing quality, if you will.

MR. SIESS: Yes, but then that's defining the method and not defining the objective.

MR. SPRAUL: True.

MR. SIESS: I thought there were some words in 17.3 that indicated that it didn't have to be an independent, separate organization out there off to one side that had no function except --

MR. SPRAUL: Yes, 17.3 says that it doesn't specify who does the quality verification, but it specifies that there will be independence, such that you can be assured that the licensee and the NRC can be assured that the verification is a true independent verification.

MR. SIESS: That sounds performance-oriented, but it sounds in contradiction to Appendix B.

MR. SPRAUL: There is nothing in 17.3 in our opinion that contradicts Appendix B in any way.

MR. SIESS: How you described Appendix B must be different than what you said.

MR. SPRAUL: Appendix B is the basic requirements document, and 17.3 is a way of implementing it.

MR. SIESS: I think you are missing my point. I asked you was there a requirement in Appendix B that required that this quality assurance manager have direct access to the vice president of nuclear and you said yes.

MR. SPRAUL: No, I said not in Appendix B. If I did, I misspoke. That is not a specific requirement in Appendix B, it is a guidance that we have put out --

MR. SIESS: It just requires sufficient

independence to be able to ensure quality.

MR. SPRAUL: Yes.

MR. SIESS: Without telling him how to do it?

MR. SPRAUL: That's right.

MR. CARROLL: However, you just raised an interesting point. Historically, most utilities have been persuaded that the Q/A manager has to report to somebody higher than the VP of nuclear -- the VP nuclear has the pressure of --

MR. SIESS: I think 17.1 and 17.2 --

MR. CARROLL: --production on him.

MR. SIESS: Does 17.1 and 17.2 specify a chain of command requirement?

MR. SPRAUL: Only to the point that, again, the individual responsible for quality assurance -- the verification of quality, if you will -- has to have the adequate independence that his responsibilities can be accomplished.

MR. SIESS: Isn't there something about he can't be the same person as one that is responsible for getting things done?

MR. SPRAUL: Absolutely. He cannot be the same person.

MR. SIESS: Yet, when we talk to people in other countries that have pretty good quality, they put an

emphasis on people doing the work doing the quality.

MR. SPRAUL: Produce the quality, absolutely.

MR. SIESS: Yes.

MR. SPRAUL: No question.

MR. SIESS: Is there any real conflict in doing things and doing them right?

MR. SPRAUL: No. That is obviously the best quality assurance program, is a program where the doers -- the performers produce the level of quality. There is nothing that the verifiers can do about that. All they can do is look at it and say yes, it meets the requirements or no, it doesn't meet the requirements. It is the performers who actually produce the quality.

MR. KERR: I think the spirit of the organizations to which Mr. Siess refers is that the performance people also verify it. That couldn't work under our system.

MR. SPRAUL: Performance people also verify it.

MR. KERR: They are also the verifiers --

MR. SPRAUL: You know, you have a man doing -- if you would -- a maintenance job at an operating plant, okay? He would be under maybe a part of a two or three man team that is out there doing it with a team leader who is verifying that the work is being done right. That is under a first line supervisor who is responsible to see that the work is done right.

Over and above that, we require a quality verifier to check that the work is being done right. That team -- if that team has three or four people on it and one of them is the quality verifier, that can be done too.

MR. KERR: If I understood your question, you were saying in some European systems the verification is built in as part of line management, weren't you; or, did I misinterpret?

MR. SIESS: I am not that sure about it, Bill. I think that what he is saying is permissible. It is different than it is now though. Is it possible now to have a three man team where two men are doing it and the third one is verifying it, and they are all under the same boss?

MR. SPRAUL: Yes.

MR. SIESS: But then somebody else is going to come in and check them?

MR. SPRAUL: The utility will have its audits who, being performance-based, will see the work going on and see that it's being done. NRC will come in --

MR. SIESS: I guess I don't understand. You have to realize that none of us are Q/A people. We are all interested in quality. By audit, does that mean somebody goes out and tests something or looks at it on a sampling basis?

MR. SPRAUL: Yes.

MR. SIESS: Not just auditing records.

MR. SPRAUL: That's correct.

MR. SIESS: Auditing --

MR. SPRAUL: Performance-based gets away from looking at records and involves actually going out and looking at the work, yes. Even auditors, surveillance people.

MR. SIESS: Is that possible under 17.1 and 17.2 or just not being done under 17.1?

MR. SPRAUL: It's not as clearly possible in 17.1 and 17.2. It is more clearly possible under 17.3. I will talk about SRP 17.3 a little bit.

[Slide.]

I will say that it requires no new staff positions. There are no changed requirements. The requirements are still Appendix B. What we have done in 17.3 is to reorient the acceptance procedures emphasizing performance. It is not a backfit. We talked about that earlier. Operating plants are not required to change -- we are recommending that they do.

Insufficient basis to require backfit because safety is not an issue, it is just a redirection of the emphasis. We believe that 17.3 should enhance performance.

MR. SIESS: Now, if Appendix B still applies and

the NQA still apply --

MR. CARROLL: Revised.

MR. SPRAUL: Revised and updated from the original.

MR. SIESS: That doesn't mean anything has been changed. Updating doesn't mean change.

MR. SPRAUL: There have been changes.

MR. CARROLL: There have been changes, Chet.

MR. SIESS: There have been changes to --

MR. SPRAUL: There have been improvements.

MR. SIESS: These are changes in the direction of performance orientation?

MR. SPRAUL: Some are, yes, sir.

MR. SIESS: They are just technical changes? I am just trying to say is 17.3 just the difference in emphasis or does it actually permit different things to be done?

MR. SPRAUL: Basically, it is a difference in emphasis. By changing the emphasis we are getting away, we believe, from the paperwork reviews into the actual reviews, verification of what is being done.

MR. SIESS: The utility could actually modify their program in a significant way and it would be approvable under 17.3?

MR. SPRAUL: Yes.

MR. SIESS: They could change the chain of command

and do a number of things like that --

MR. SPRAUL: They could reorganize.

MR. SIESS: -- which would still meet Appendix B and still meet NQA, but wouldn't have been approved by a reviewer working under 17.2?

MR. SPRAUL: That's correct.

MR. CARROLL: One example is, as I read 17.3, I could go to a much smaller "Q/A organization" that would be more managers of audits that would utilize other people than I probably could have gotten away with under 17.2.

MR. SPRAUL: That's correct.

MR. CARROLL: I could have moved the people that were in Q/A perhaps into my Q/C organization which is part of my line organization in my scheme of things.

MR. SIESS: Separation and independence doesn't have to include so many people. Okay.

MR. SPRAUL: Item three, we believe that 17.3 eliminates fragmentation and overlap. Again, just going to NQA-1 and NQA-2 from the N-45.2 and its daughter standards will make a difference there. We have attempted to simplify, clarify and consolidate the text. We are going to use the up-to-date industry consensus standards in our review. We will emphasize the greater the approach to quality assurance, and it's less prescriptive than 17.1 and 17.2. It is less emphasis on how to do Q/A and more

emphasis on the results of Q/A.

MR. CARROLL: I think the graded approach needs some commentary. That is very important. There are a lot of activities out there where it just doesn't make sense to apply the full blown Q/A program to them, but they are important to safety. At least my explanation of graded approach would be that you select the things out of your Q/A program that really apply to that activity, and just those are considered.

MR. SIESS: That sounds good.

[Slide.]

MR. SPRAUL: Where do we stand on implementation in Section 1.73? It was noticed last month in the Federal Register, it has been issued internally. We are now in the process of developing reviewer training that would be given to the reviewers both at headquarters and in the regions, and then we will train the reviewers. I have Item five to inform industry. I am not sure that we have to do anymore than we have done. We got seven questions from Region V just last week that came from the utilities out there, and we responded to those just last week.

It is mentioned as the late news in the September Nuclear News notice that 17.3 was out there. So, we think at least industry knows it is there and is taking a look at it.

Question and usage of 17.3. As I understand it, DOE is using NQA-1 and NQA-2 with its contractors, and the work that is then being done under DOE under the NQA-1 and NQA-2 standards, a company like General Electric or Westinghouse or something like that, they can now incorporate their program into one program and not address the old ANSI N-45.2 and the daughter standards but address the NQA-1 standards.

[Slide.]

Several utilities have already gone to a QAPD/QA program description format more in line with 17.3 To mention names GPU Nuclear, TVA have their Q/A program descriptions which are more in line with 17.3 than with 17.1 and 17.2.

MR. SIESS: Is NQA-1 and NQA-2 different than the N-45? I thought earlier --

MR. SPRAUL: The differences, I would say, are improvements. I would say that the differences that are there are improvements. For example, I mentioned that NQA-2 has added Q/A requirements for four different areas like software controls. That is in NQA-2, it's not in the daughter standards. That's an improvement, in my mind. It's a difference, but --

MR. SIESS: It's an improvement in the sense that it includes something that wasn't included before, or that

it does it differently or better?

MR. SPRAUL: The example that I gave you, it includes something that was not included before. The incorporation of the daughter standards in N-45.2 was pretty much not an upgrade, it was just a combining, getting rid of the stuff that was duplicated in each one of them and things like that.

At least one utility has committed to meet NQA-1 and NQA-2 instead of N-45.2 and its daughter standards, that's Niagra Mohawk at Nine Mile. I understand too, that Commonwealth Edison has committed to NQA-1 and NQA-2.

MR. SIESS: Does that change anything that they are doing?

MR. SPRAUL: Does it change anything they are doing?

MR. SIESS: Or, does it just change some numbers?

MR. SPRAUL: I think it makes it more clear to the people what they are supposed to be doing. I think that it makes it more clear to the people that they have to address in their Q/A program for example software control at the operating plant.

MR. SIESS: That isn't actually different.

MR. SPRAUL: It can change things, yes. In combination with 17.3 --

MR. CARROLL: The flip side of that, that they

have to worry about software control is that that has been a point of contention between inspectors and the utilities as to what is adequate in that area. So, having something at least that both the NRC and the licensee understand --

MR. SPRAUL: This would be an acceptable thing, that's all.

MR. CARROLL: -- can cause a lot of heartache.

MR. SIESS: In other words, it's nice to have a standard.

MR. SPRAUL: Yes.

MR. SIESS: That's what standards do.

MR. SPRAUL: Yes.

MR. CARROLL: Ongoing dialogue.

MR. SPRAUL: That is the extent of my presentation. If there are no further questions of me, I will turn this over to Eileen.

MR. KERR: May I?

MR. SPRAUL: Yes, sir.

MR. KERR: I think in your view the Q/A program decreases power plant risk; does it not?

MR. SPRAUL: Yes, sir.

MR. KERR: Do you think this is reflected in the PRA's that are done? For example, do PRA people look to see if one has a good Q/A program or poor Q/A program, and is this then reflected in the results of PRA's?

MR. SPRAUL: I'm talking off the top of my head. I don't really know. To my knowledge, the PRA people don't look at Q/A programs and compare one versus the other to my knowledge. I don't know.

MR. KERR: Shouldn't they if they are going to have a significant influence on risk?

MR. SPRAUL: I think one of the biggest problems with PRA is personnel and personnel performance, and Q/A is very closely related to that.

MR. KERR: This must be reflected, if by performance you mean results. It must be reflected in the number of shutdowns and the reliability of equipment and all sorts of things that have to do with plant operation should result from this if it does actually decrease plant risk.

MR. SPRAUL: That's true. Actually, every operating plant -- every licensee has given us a list of commitments, a Q/A program description if you will, that meets Appendix B. So, basically, they committed to meet Appendix B. If they don't meet Appendix B, they are --

MR. KERR: Are you telling me that the Q/A programs in all plants are equally good?

MR. SPRAUL: I am certainly not even implying that, let alone telling you that.

MR. KERR: I am just suggesting that maybe you ought to talk to the PRA people and tell them if they really

want to make their PRA's more accurate they ought to take into account the Q/A program.

MR. SPRAUL: I will do that.

MR. SIESS: I don't think they take into account something that has been built under a Q/A program or something that hasn't been built under a Q/A program.

MR. KERR: Maybe they should.

MR. SIESS: That's just one of the uncertainties, Bill. That concludes your presentation?

MR. SPRAUL: Yes, sir.

MR. SIESS: Thank you very much. It has been very helpful. The remaining is going to be on what, the tech specs?

MS. MCKENNA: Yes. I also asked Fred Allenspach of our branch to talk a little bit about some work that we are doing in the standard tech spec improvement area that we hope will carry forward some of these same concepts of encouraging performance-based look at reviews and audits and assessment activities, carrying forward the same kind of things of putting some of the responsibility back further in the line, encourage more emphasis on results rather than the structure of these review organizations, and some of the same philosophies that Jack was mentioning.

MR. SIESS: When you said tech spec improvement program, was that in all caps?

MS. McKENNA: Yes, it is part of that larger tech spec improvement program.

MR. CARROLL: I guess before we move onto the tech specs, how is this being accepted by the professional Q/A guys out in the regions and utilities; do they like this idea?

MS. McKENNA: As far as the regions, we circulated the SRP to the regions for comment before it was issued, and there was a lot of support for the approach and some questions about exactly how it was going to be done which we tried to address with the training. I think as far as the industry, it's still fairly new out there. We have required a lot of inquiries, and I think there is interest in moving in this direction. They are all just waiting to see what is there and how it gets carried forward, to see what difference it is going to make to their organization.

MR. CARROLL: I read the comments from the regions, and I also sensed in there the -- I want to look at the paper Q/A mentality saying I don't like this very well. Is there some of that?

MS. McKENNA: It's true, every time that you get something less prescriptive there's more room for people to look at it a little differently, and that's one of the risks that you run with this kind of thing. We think that on balance it is a better approach, and we will have to be

working with the regions in the training and discussions with them to bring them to the same acceptance that we have come to.

[Slide.]

MR. ALLENSPACH: Section 6 of the standard tech specs is being revised as part of the new standard technical specifications program. In another slide you will see where that changes to a Section 5. Section 6 is the administrative control section.

Section 6 has several aspects that comprise really major aspects of utility self-assessment program. The Section 6 is based on Section 1.34 of the standard review plan.

MR. SIESS: What is that section?

MR. ALLENSPACH: Operational review.

[Slide.]

These are the aspects of self-assessment that are in the current Section 6 of the technical specifications. Section 6.2.2 is the independent safety engineering group.

MR. KERR: What is that independent of?

MR. CARROLL: Plant organization.

MR. ALLENSPACH: It is independent of the plant staff. That came from the TMI action plant item IB.1.2. That is made up of a group of engineers that are independent from the plant staff.

MR. KERR: Are they operations oriented or performance oriented, I should say.

MR. ALLENSPACH: They are a variety of disciplines, probably one of whom is operationally oriented.

MR. KERR: Are they performance-oriented?

MR. ALLENSPACH: Not particularly performance-oriented.

MR. SIESS: Safety-oriented.

MR. ALLENSPACH: Their idea there is to be safety oriented to make recommendations to plant management.

MR. KERR: I am using the term in the sense in which I thought you had concluded in Q/A that performance-oriented Q/A was better than paper oriented Q/A, and I just wonder if that sentiment is penetrating the --

MR. ALLENSPACH: These people are principally performance-oriented, as a group.

MR. CARROLL: I don't know. I would say that they are there -- you have a group that has a lot of breadth, operating guys, guys with a good background in INC and you name it. And, they should be the people that are on a day-to-day basis at the plant, taking a look at how operation and maintenance is being performed and they don't get their paycheck from the plant manager. They should be making recommendations to him on how the plant is performing. That

has been my concept of that group.

Typically, they report to somebody downtown.

[Slide.]

MR. ALLENSPACH: The next section is Section 6.5, currently titled review and audit. One part of that is the unit review group, which is the plant operations review committee. This is made up of members of the plant staff that do in-line reviews. The other aspect of that Section 6.5.2 is a company nuclear review and audit group that is independent from the plant staff. That's the way it is currently in this technical specifications.

[Slide.]

The revised new standard technical specifications, Section 6, is going to be relabeled Section 5.5. Those aspects that relate to assessment, self-assessment, will be in Section 5.5 that we are titling review and audit. One section is the 5.5.1 which is the current plant reviews, and the new Section 5.5.2 is off-site review and audit -- we have taken the old responsibilities of the old company review and audit group. This is essentially the function of the old ISEG. We have put them together now into one category, since we have tried now to lump all this together.

MR. MICHELSON: What category is that?

MR. ALLENSPACH: This is called off-site review

and audit. In other words, these are reviews and audits that will be independent from plant staff.

MR. CARROLL: Yes, but that's a misnomer because the ISEG is an on-site group. They just aren't part of the plant organization.

MR. MICHELSON: Yes.

MR. ALLENSPACH: You are saying technically the word off-site may not be correct. As a matter of fact, some of them are on-site. We get into this dialogue of who is on-site and who is off-site.

MS. McKENNA: We are trying to imply -- indicate that this was those that are independent of the plant staff. We did have this discussion, in fact, I think we actually have it in brackets in our tech specs because we recognize that these people may physically be located on site but the point we are trying to get across is that --

MR. CARROLL: Generally are.

MS. McKENNA: --independent from the plant staff.

MR. ALLENSPACH: The next thing they do is, the utility puts them on-site, and then we are confused.

MR. CARROLL: Why don't you retitle it review and audit independent of the plant organization?

MR. SIESS: It takes more words.

MR. MICHELSON: Independent review and audit.

MR. SIESS: Independent of where?

MR. MICHELSON: The site.

MR. SIESS: What is the difference between a review and an audit?

MR. ALLENSPACH: An audit, I guess I would go back to Jack -- it is more of looking at a piece of paper to make sure that certain things were checked off and done, while a review is looking more at the content rather than at the piece of paper.

MR. CARROLL: Having served on one of those Committees for about 30 years, what we considered review was looking at all the license applications we made and all that stuff and also reviewing the operating experience that had taken place -- LER's and all that good stuff. The audit piece of it was to look at audits that had been done by the quality assurance department, actual formal audits.

MR. SIESS: The difference is what you do it to, not what you do?

MR. CARROLL: Yes.

MR. SIESS: In both cases you look at it, but one thing you look at this and another you look at that.

MR. CARROLL: Yes.

MR. SIESS: It's not a difference in who does what to the same thing but in what you do to different things.

MR. MICHELSON: It just isn't real clear to me

what happened to ISEG. From your previous slide it doesn't seem to fit in any of the categories.

MR. ALLENSPACH: ISEG will disappear -- the function will remain.

MR. MICHELSON: That's not clear.

MS. McKENNA: What was hard to show on the slide is the text that we put in there. I think this next slide gets to it, that instead of specifying you shall have an ISEG that looks like this that does these things and you shall have a corporate group that looks like this and does these things, it says you will have a process. You tell us what that process is. These are the functions that that activity and organization have to accomplish. Those are still the same responsibilities and functions, but there is more opportunity for them to be done in a d

MR. ALLENSPACH: What we are trying to say is --

MR. MICHELSON: Some of them will be done on site and some off-site?

MS. McKENNA: Some will be done on site and some off-site, and some may retain the ISEG structure and some utilities may keep the existing structure and others may want to go to a more integrated group somewhere that does all of these things. We are allowing all of those opportunities.

MR. ALLENSPACH: What we are trying to say now is

that the important thing is the function and not the structure. Here again, as with the 17.3, we want to change the emphasis.

MR. CARROLL: Would a good example be that in the past you had to have an ISEG and you had to have a Q/A organization as separate things.

MS. McKENNA: Yes.

MR. CARROLL: That has always, in one sense, looked crazy to me. Why couldn't you integrate the two functions.

MR. ALLENSPACH: You also had a company nuclear review group, and they all reported to different places.

MR. MICHELSON: I thought ISEG had to be on site? Was that requirement or just the way it usually worked out?

MR. ALLENSPACH: With the ISEG, there was a requirement from the TMI action plan that several of those people had to be on site, actually looking at the operation.

MR. MICHELSON: Not it's not clear that any of them have to be on site performing that function.

MR. ALLENSPACH: It will be if you look at the detail of what is coming out in the specification.

MR. SIESS: The emphasis is what they accomplish. If they can do it from off-site, I guess it's all right.

MR. CARROLL: No, they can't.

MR. MICHELSON: That's the problem.

MR. ALLENSPACH: No.

MR. SIESS: The thing is, you are not telling them you have to do it this way and that way.

MR. CARROLL: Most utilities had people with Q/A in their on-site also.

MS. McKENNA: Yes.

MR. CARROLL: What I am suggesting is that the two functions really logically could be combined.

MS. McKENNA: I think that that's one of the reasons -- fortunately, we are able to make these kind of proposed changes in the tech specs at the same time that we are making them in the Q/A organization, because we do see that we don't want Q/A and ISEG and two other people to be doing all the same things as long as all those things are being done by somebody who is qualified to do it.

MR. SIESS: Do you think it would be possible to accomplish all of these things we want and to write tech specs and standard review plans and write standards using only the word "quality" and never using the word "assurance"? I hear Q/A so much and I have never been able to establish a real clear relationship between that and quality.

[Slide.]

MR. ALLENSPACH: Just getting back to sum this up now. What we would allow in this really to not come to

pass previously is, would it be possible to take all these activities now and just say nuclear safety department and take these assessment functions and put them into a department so that we can focus more then on those functions rather than on the structural aspect.

MR. SIESS: Excuse me. What you just described is quality verification.

MR. SPRAUL: True.

MR. MICHELSON: If you are going to say too much, use the microphone over there. Otherwise, our Reporter has trouble getting this.

MR. SIESS: That's all right. Go ahead. He said yes.

[Slide.]

MR. ALLENSPACH: Where this stands right now is that the revised Section 5.5 has been distributed to the Owners group.

MR. SIESS: What owners group.

MS. McKENNA: Owner groups, it should say.

MR. ALLENSPACH: As part of the new tech spec program.

MR. SIESS: That's groups, right?

MS. McKENNA: Yes.

MR. ALLENSPACH: Groups.

MR. SIESS: These are the generic owners groups,

or is there an owners groups working on tech spec improvement.

MS. McKENNA: They are generic -- Westinghouse owners group and --

MR. ALLENSPACH: The generic --

MR. KERR: There are two people talking simultaneously. If you want to get on the record, you ought to repeat what you said and not at the same time.

MR. WARD: Or, just say it loud.

[Laughter.]

MR. ALLENSPACH: As a matter of fact, in some interim before we got to Section 13.4 in the SRP revision, I understand in a couple of months you will get the whole new standard tech spec package down here. After that, it will go to CRGR. When that approval process is completed, then we are going to go ahead and revise Section 13.4 of the SRP.

MR. SIESS: The 17.3 have to go to CRGR?

MS. McKENNA: Yes, it did.

MR. SIESS: Did you have any problems?

MS. McKENNA: Yes. They had a couple of minor comments that they wanted to have incorporated. Basically, they approved the issuance of it.

MR. SIESS: Did they understand it?

MS. McKENNA: I believe so, yes.

MR. SIESS: Are you still open for questions?

MR. ALLENSPACH: Yes.

MS. McKENNA: Yes.

MR. SIESS: Bill, did you have a question?

MR. KERR: I was going to say that after this convincing presentation, I am more and more curious as to why the NRC doesn't have a Q/A program.

MR. SIESS: The NRC.

MR. KERR: Yes. It is clearly something that improves quality and makes it more assured and yet, the NRC resists it. I am not asking for a response necessarily, I am just puzzled.

MR. ALLENSPACH: Let me respond.

MR. SHEWMON: That would be preaching to the converted.

MR. SPRAUL: Let me respond. I think the NRC has a contractor in-house right now that is looking into the development and installation of a total quality management program -- TQM, total quality management. This is the latest buzz word in the industry.

There is a contractor in-house who is coming up with a program to bring that into the NRC operation.

MR. KERR: Total quality management doesn't -- that would have to include Q/A but it would be broader than this, I take it.

MR. SPRAUL: That is my understanding.

MR. KERR: I shall look forward to that development.

MR. WARD: If a licensee developed a total quality management program, would the NRC excuse the licensee from compliance with the traditional requirements?

MR. SPRAUL: I think the total quality management program would indeed have to meet Appendix B by regulation. In addition, I would expect it to do other good and great things.

MR. SIESS: If you remember from the meeting that we had --

MR. WARD: That is not what I have thought total quality management was all about.

MR. SIESS: Total quality management is mainly three words right now that I think they have come up with this year. As I recall at our meeting in San Diego --

MR. WARD: It's older than that.

MR. SIESS: -- a couple of years ago, the Japanese said oh, yeah, our program is based on Appendix B but it doesn't look anything like ours. Actually, Appendix B gives you a fair amount of flexibility.

MR. CARROLL: It has certainly given the staff a fair amount of flexibility over the years.

MR. SIESS: Yes.

MR. MICHELSON: Yes.

MR. SIESS: Are there any other questions, anybody?

[No response.]

MR. SIESS: Thank you, Eileen. I will turn it back to you, Mr. Chairman.

MR. MICHELSON: We will take our lunch break until 1:00 p.m., and then pick up on international activities.

[Whereupon, at 12:02 p.m., the Committee recessed, to reconvene at 1:00 p.m., this same day.]

AFTERNOON SESSION

[1:04 p.m.]

MR. MICHELSON: Gentlemen, we are ready for our next agenda item, which is international activities. Bill Kerr is the Cognizant Subcommittee Chairman.

MR. KERR: We are fortunate to have with us this afternoon three people who recently participated in working group meetings in the Soviet Union, and who have a continuing responsibility associated with the joint U.S.-USSR working agreement on reactor safety. That's not exactly what it is called, but I think that's close. They have agreed to take time out of their schedules to tell us something of what occurred in this recent meeting.

I understand that Jim Richardson is going to be the first speaker because he schedule demands that he not be able to stick with us too long. So, I won't cut into his time anymore and I will simply introduce him and say that together we enjoyed some of the hospitality in Moscow. Jim was able to dig up a rather interesting culture in Leningrad when we arrived also, so he is apparently an expert on the Soviet System and not just reactor safety.

MR. RICHARDSON: I will start out with a disclaimer. [Slide.]

For the record, my name is Jim Richardson. I am the Director of the Division of Engineering Technology in

NRR. When Chuck Serpan gets up he is going to give a broader overview of the whole JCCCRS which stands for the Joint Coordinating Committee for Civilian Reactor Safety which was initiated back in early 1988 and formulated with the first visit by Chairman Zeck later that year.

Out of that first protocol or agreement was a designation of ten working groups. I am going to talk a little bit about working group ten, which is the working group on erosion/corrosion of piping and components. We had an initial meeting in December of 1988 in Moscow. That was principally an organizing meeting. I and Al Toboda, representing the NRC, met with our Russian counterparts in December of 1988 where we gave them a brief overview of some of our experiences here in the United States with erosion/corrosion centering principally on the Surry Event which had occurred a little while before that.

The Soviets then gave us a little bit of an overview of what they were doing in the area of erosion/corrosion. That December 1988 meeting was not what I would call a substantive technical exchange, it was more of an organizing, get acquainted type of meeting. Our first real technical meeting occurred in June of 1989 here in Washington, where we had three days of concentrated technical exchange with our Soviet counterparts in the area of erosion and corrosion of piping.

It was mostly an exchange of technical papers conducted much like you would a typical technical conference. At the end of that meeting, I was a little discouraged, in that it didn't seem that we here in the U.S. and particularly the NRC were particularly benefitting by the exchange. There were no particular revelations from the Soviets that in any way in my opinion really enhanced what we were doing.

I am not sure on their part, whether they received a whole lot of new information other than just gaining insights into each other's operational experiences. It was my recommendation to the EDO Jim Taylor, who is the Joint Chairman of the JCCCNRS that working group ten come to a close sometime within a year; that we would probably be able to exchange about all we needed to within a year. He took that proposal forward and it was accepted by the Committee that working group ten, after meetings in 1990, would go out of existence. That was the agreement, with the understanding that there would be one more visit to the Soviet Union and the Soviets would visit the United States one more time.

We wanted particularly to emphasize visiting laboratories and seeing some hands on experiences if we could of what they are doing in the area of erosion/corrosion, water chemistry, non-destructive

examination. So, the Soviets set up several visits for us in preparation for out trip in June.

We then went to the Soviet Union in June of 1990, and the Soviets will be coming here later this month. I will talk a little bit more about that, and that will bring to an end the workings of working group ten -- it will come to an end.

[Slide.]

Our principal focus for our trip in June were these three items; water chemistry, separation and transport of corrosive products and NDE methods and techniques.

MR. CARROLL: I know that transport of corrosion products means but I am not sure of the term separation.

MR. RICHARDSON: I am not sure that I do either. I am not really sure -- I would guess that is what I was meant by that.

MR. WILKINS: You have corrosive and he said corrosion. I think there's a difference.

MR. CARROLL: Yes, it should be corrosion.

MR. RICHARDSON: Yes, corrosion -- it should be corrosion products.

MR. WILKINS: Corrosion.

MR. RICHARDSON: I think that was probably just copied off -- that may be how it came out in the translation. I want to talk a little bit about these

subjects and the conclusions that we have discovered or some of the things that we discovered in meeting with them in discussing these topics.

We met in Moscow for the first week and had about three and one-half days of meetings with our Soviet counterparts. Then, we had tours of several laboratories in the Moscow area, and the Soviets were kind enough to charter an airplane for us and we spent the next week touring some laboratories and nuclear power plants in the Leningrad area and in Zoporozhie in the Southern Ukraine.

All in all, the trip was utterly fascinating. It was a unique opportunity to see Russian culture up close. We did get to see a diversity of not only cultural things but getting to know the Soviet technical people a little bit, getting to see some of their laboratories up close, and all in all, I found it to be a very interesting trip. In the end, we got much more out of this trip than we did our previous meetings. Rather than a pure dry technical exchange I think we did come back with some unique insights that are going to be beneficial to us, and I will get into some of those.

In the area of water chemistry some of the discoveries -- we found it interesting that in their PWR's, their VVER reactors, they allow a chloride level that is much higher than we allow here in the United States. They

specify a 150 parts per billion chloride as opposed to 20 ppb here in the United States, which we found interesting.

MR. SHEWMON: This is the secondary side.

MR. RICHARDSON: On the secondary water chemistry in their PWR's.

MR. CARROLL: Did they provide a rationale for why that's okay?

MR. RICHARDSON: Their rationale was that they thought that was good enough. They believe that they have discovered some ways of inhibiting the corrosion process. They have developed -- I am not sure what I would call it -- a passivation technique, an additive that is called octadysolomene -- ODA -- that they add to their water chemistry and it forms or promotes an oxide layer on the inside of the pipe.

MR. SHEWMON: Do they have carbon steel support plates?

MR. RICHARDSON: Yes.

MR. CARROLL: They have horizontal steam generators.

MR. RICHARDSON: They have horizontal steam generators, but they have carbon steel.

MR. SHEWMON: So, denting could occur in that geometry too?

MR. RICHARDSON: Yes, and I want to touch on that

when I talk about steam generators. They are, in fact, having some problems. They have instituted this ODA at a few plants principally in East Germany and in Hungary, although when we visited both the Zoporozhie plant and the RBMK plant in Leningrad, neither of the plant managers had ever heard of this. It is not well known throughout the Soviet Union.

Incidentally, we found that the Soviet Union suffers some of the same problems that we have here in their bureaucracy -- communications between laboratories and between nuclear power plants is atrocious. They have no idea what the right hand is doing or the left hand either. The technical communication is just abysmal and very frustrating to some of them. We noted that and talked about it to them and felt that it was a problem they may have, and they readily admitted it. There is not a good technical exchange in the community. They are highly compartmentalized and small bureaucracies that do not communicate well with each other.

They have developed, as we in the United States have developed, some computer programs that would predict where erosion and corrosion were to take place in piping systems and use that program to dictate where they perform their inspections just as we do here in the United States. They have developed a program very similar to the program

that EPRI has developed called check and checkmate, and they have been working on this for the last couple of years and have agreed to send that program to us so that we can look at it closer and compare it to the programs that are used here in the United States.

MR. CARROLL: Going back to your additive, at what concentrations is it --

MR. RICHARDSON: I don't know. It is a proprietary formula that they are quite anxious to sell. I might add that in our group -- in my working group ten on this trip -- we had quite a diverse group. Al Toboda from the Office of Research was with us as well as Carl Kachowski from Brookhaven National Laboratory, who is an erosion/corrosion specialist. Dr. Paul Woo from the Department of Energy who used to work for the NRC and -- he worked quite extensively with the Surry event. And, we had Dr. Jerry Gordon from General Electric Company head of the materials department and Dr. John Wooten from Westinghouse Electric Corporation who is head of the steam generator department at Westinghouse.

They were able to add greatly to the group's knowledge and ask the right questions, and as well as presenting their experiences in the United States.

They have also come to the conclusion that they need to get copper out of the secondary side and are making

great efforts like we in the United States when they replace things like condensers that have copper tubes, they are replacing them with titanium tubes, same as we are here in the United States. MR. CARROLL: Do they use condensate polishing in the VVER plant?

MR. RICHARDSON: Yes. They are also working on acoustic emission quite heavily in the USSR to locate cracks as they occur, and they have been able to -- they claim, although we did not see it in operation -- they claim that they can locate a crack within a half a meter at a distance of one hundred meters, which is rather impressive if they can in fact do that.

MR. SHEWMON: This is then in piping of some kind?

MR. RICHARDSON: Yes, that's correct. The theory being, if a crack is to form and starts growing they can hear it.

MR. CARROLL: When you specified the precision of being able to locate it at 100 meters, you mean -

MR. RICHARDSON: Their transducer would be 100 meters away.

MR. CARROLL: Within 100 meters of where the crack is?

MR. RICHARDSON: Yes, and they can locate that crack within plus or minus one-half meter.

MR. WILKINS: What is in between, piping?

MR. RICHARDSON: Yes.

MR. WILKINS: There is no wall?

MR. RICHARDSON: No.

MR. SHEWMON: No pipes, so 100 meters long in anybody's nuclear plants without T's and joints --

MR. RICHARDSON: I am sure this was probably laboratory and ideal conditions. I am skeptical in fact that under operating conditions they could be that accurate, but that was their claim.

MR. SHEWMON: Do you have any idea what they are listening for, because that's not the range that people in this country have thought they could do.

MR. RICHARDSON: Yes, I am fully aware of that, and we all raised our eyebrows when we heard that and asked for more details and didn't get a whole lot of detail. They are also beginning to develop new materials that are more corrosion resistant, particularly high nickel and chromium steels to resist corrosion.

In addition to our meetings where we exchanged theory and practice --

MR. SHEWMON: Back up for a minute. That was a crack growing at 100 meters or a leak?

MR. RICHARDSON: A crack, not a leak. I guess from the very first time that I was there in December of 1988 it was just reinforced in this trip, my impression of

our colleagues in the Soviet Union is that academically they are among the best. They are great theoreticians, they have a solid understanding of basic physics and basic principles, and have developed what I would consider as some rather elegant approaches -- theoretical approaches to the problems.

Where I think they fall short is in their experimental side and operational side. I would attribute that mostly to economics. Their laboratories are very crude, very simplistic, and by our standards at least very outdated. Nevertheless, using what I would classify as rather antiquated equipment, they are doing some rather elegant experiments and taking full advantage of what they do have.

Among the laboratories that we visited were these laboratories, and let me just give you a quick impression of what we saw at these laboratories, the first being the All Union Scientific Research Institute of Nuclear Power at Electrogorsk which is a small town about 50 miles outside of Moscow. It's a new laboratory that is just being put together, and most of their programs are in the proposal stage. There is a very enthusiastic director of the laboratory who was just bubbling over with enthusiasm of getting his new laboratory underway and looking for all sorts of cooperation with folks here in the United States.

MR. CATTON: What was his name?

MR. RICHARDSON: It just escaped me.

MR. CATTON: It isn't Nigmatulen, is it?

MR. RICHARDSON: Nigmatulen, yes. Another interesting part of that laboratory is right next door to it, is an old fossil plant which was originally built to burn peat. It has now been converted to a coal plant but we toured that plant,and in that steam plant they are getting ready to conduct several experiments -- erosion/corrosion experiments using the environmental of that fossil plant.

It gives them quite a bit of capability. With Nigmatulen's enthusiasm, if he can get some money, it looks like they are going to be doing some valuable experiments in the area of erosion/corrosion there. They are also developing a jet pump for their passive BWR that they are in the design stages now and are doing some experiments at this old fossil plant at Electrogorsk.

Then we visited the Research and Development Institute of Power, Energy and Science in Moscow, where again, they are conducting experiments on corrosion and doing experiments in water chemistry. Here again, the laboratory was very austere, equipment that probably dated from the 1940's and 1950's. They are doing some, what I consider to be some basic experiments also looking at crack behavior in reactor vessels. They get specimens from

another laboratory near Leningrad that I will talk about later.

We then visited the Kurchatov Atomic Energy Institute MR reactor in Moscow, and that's where we had our technical meetings was at the Kurchatov Institute. There, they have a small pool reactor that was built in 1963, a 50 megawatt thermal reactor -- pool type reactor. They are doing water chemistry experiments --

MR. KERR: Fifty megawatt is not a small research reactor.

MR. RICHARDSON: I didn't say research reactor.

MR. KERR: Oh, all right.

MR. RICHARDSON: It's an experimental reactor. It is certainly not small.

MR. KERR: I misunderstood you.

MR. CARROLL: It's a pool reactor.

MR. RICHARDSON: Yes. They have the capability of carrying on ten simultaneous experiments and can insert and extract experiments in ten different loops to carry on, so it gives them a lot of flexibility to do these experiments. The reactor produces about two times ten to the 14th neutrons per square centimeter flux. It's a valuable tool that they have.

We then visited the All Union Scientific Research Institute of Atomic Machine Building in Moscow, where they

are conducting experiments on the prevention of erosion/corrosion, and it is at that laboratory that they have developed this compound ODA and were touting that. I know John Wooten from Westinghouse was very interested in following up with them, and has I think been in further contact with them as has Jerry Gordon from General Electric. So, two of our vendors here in the U.S. are doing some follow up on this ODA to see if it has application here in the U.S.

We visited the Central Research Institute --

MR. CARROLL: The notion of this stuff is to prevent erosion/corrosion in the piping system.

MR. RICHARDSON: Yes.

MR. CARROLL: Does it also protect steam piping, or is it just for the water piping?

MR. RICHARDSON: I'm not sure. They were talking about it in the context of secondary piping on the secondary side.

MR. CARROLL: That could be the feedwater or steam pipe, or both.

MR. RICHARDSON: Yes.

MR. WILKINS: Your report uses the language single and two phase flow.

MR. RICHARDSON: Yes, it does.

MR. SHEWMON: Before you get organized again, the

West Germans and some of the Europeans have used a different Ph in their water systems as a way to control erosion/corrosion; did you hear about that technique?

MR. RICHARDSON: Yes, a little bit. Originally the Soviets apparently were tending more toward neutral chemistry, a Ph around seven. They have now concluded that a higher Ph will serve to inhibit the erosion/corrosion process and are now specifying a Ph of 9.2, which some of our plants are up in that regime as I understand it.

MR. SHEWMON: Look where it got us.

MR. RICHARDSON: The next laboratory we visited was the Central Research Institute of Structural Materials known as Prometey, near Leningrad. This is a military laboratory a few miles outside the city of Leningrad. I would equate it to our naval research laboratory, where their primary mission is to develop and test materials used for ships and submarines.

We had the privilege of walking through what they call their museum,and I don't think there have been many Westerners that have walked through that museum. We saw what was amazing material. They were showing us the titanium used in their new typhoon type submarines, they showed us the double hull design of their submarines. They showed us their new sound dampening material that they are using on those submarines as well as their anti-cavitating

propeller that is designed by Toshiba, I guess.

MR. CARROLL: How about their Red October Propulsion system, did they?

[Laughter.]

MR. RICHARDSON: I didn't see that but I was amazed at what we were able to see, because I think we were to be shot if we were to see anything like that in the United States. MR. LEWIS: You didn't see the Alpha Submarine, did you?

MR. RICHARDSON: Just the typhoon. It was a new titanium that they were using. There was quite a contrast between that laboratory and other laboratories that we had seen. It was obvious that they were well healed. They had lots of money, they were using very modern equipment, and it was obvious that money was not a limiting factor in that laboratory.

They were doing several experiments in the nuclear power area, particularly on reactor pressure vessels. My impression, not being an expert at all, looked like they were doing experiments very similar to our HHST program where they were doing heavy section experiments. Chuck Serpan has subsequently visited that laboratory because the director of that laboratory was very persistent in particularly talking with Commissioner Remick in trying to secure a cooperative agreement with somebody in the U.S.

Chuck Serpan subsequently went there to look into it in more detail.

Chuck, are you going to talk about that at all today?

MR. SERPAN: Yes.

MR. RICHARDSON: He will give you some impressions of that subsequent visit. But anyway, a well equipped laboratory, heads and shoulders above the other laboratories that we visited.

Then we walked through the Leningrad Nuclear Power Plant, Leningrad I, which is a RBMK twin to Chernobyl. It is out on the Bay of Finland, 30 or 40 miles outside of Leningrad. An interesting aside to that, several of us had our wives with us. They had accompanied us out to the Leningrad plant because we were going to visit some sites later that afternoon. So, we fully expected our wives to sort of cool their heels while we walked through the plant and the Russians would have nothing to do with that.

They insisted that our wives accompanied us on our tour of the plant. Our wives dressed up in the white coats, booties and all that which my wife found thrilling. We toured the plant. Not only did we tour the plant, but they opened the door and we walked out and were standing out on the core at 100 percent power which was thrilling, to say the least.

There I stood, hand in hand with my wife, on top of an RBMK at 100 percent power.

MR. WILKINS: You have already had your family?

MR. RICHARDSON: Yes.

[Laughter.]

MR. RICHARDSON: I was checking my dosimeter every five minutes. Interesting, to say the least.

Some impressions. My first impression was -- certainly it was an impression of an amateur. It seemed to be a lack of fire protection in that plant. We saw hallways going the full length of the building without any fire doors in them. I saw no evidence of fire suppression systems -- any evidence at all. Once in a while I saw a fire extinguisher somewhere, but nothing like we see here in the United States.

In the control room there was one operator in the whole control room. There were alarms going off here and there as they always do, but he was the only person in the control room. The control room itself had no physical protection to it at all from an intruder. In fact, it had a wooden door on it with a glass. All you had to do was open the door and walk in.

We saw a lot of people walking around the plant in what I consider to be vital areas with no dosimetry at all.

We then flew to Zoporozhie in the Southern Ukraine

to visit the VVER 1000 there. There, they have five units in operation and one unit under construction. That was more familiar territory. It looked more like a Westinghouse PWR with some notable differences, primarily their steam generators laying on their side as opposed to vertical steam generators.

There, they told us that they are having a lot of problems with their steam generators. They are getting what they think is corrosion assisted fatigue in the juncture of their tubes to the tube sheet. Their tubes are made of stainless steel and they are explosively welded into the tube sheet, and at that juncture they are getting corrosion assisted fatigue to the point where they believe that they are going to have to replace all of their steam generators at Zaporozhie which is a lot of steam generators.

In fact, they believe that eventually all steam generators -- all VVER steam generators will have to be replaced in the Soviet Union. Their tube sheet is in the middle, and then they go out each way from that.

MR. SHEWMON: Two tube sheets.

MR. RICHARDSON: No, it's one tube sheet. I can't give you a diagram because I don't understand it myself. It doesn't look right to me.

MR. SHEWMON: There has to be some place for the hot water to --

MR. RICHARDSON: Yes, and I couldn't sit down and draw that for you. They have had no tube ruptures in their experience so far. Interestingly, they have only plugged four tubes at Zoporozhie so far, but they don't plug until they leak. They don't have a plugging criteria as we do here.

MR. SHEWMON: If they have enough trouble with them that they are going to replace them --

MR. RICHARDSON: Yes, but they have not had the plug in.

MR. SHEWMON: There must have had some failures.

MR. CARROLL: They have had leakage.

MR. RICHARDSON: They have leakage, and that's it.

MR. SHEWMON: Only four tubes and they are going to replace the steam generators?

MR. RICHARDSON: Yes. That's their plans. They allow a certain amount of leakage, and the leakage is growing. They do very little current testing and very little non-destructive examination. They rely on leakage to decide what to do.

Interesting, we got into a heated discussion with them on doses to workers. We came away with the opinion that they really measure their doses quite differently than we do here in the United States. Just a for instance, it's not even necessary to wear dosimetry if the area itself

receives less than 3.5 millirem per hour you don't even have to wear your dosimetry if you are in an area of 3.5 MR per hour.

We have concluded that their claims of very low worker radiation may be because a lot of places they don't wear dosimetry.

MR. KERR: They also claim very low accumulated doses for replacements of steam generators that were amazed -- I think was the word -- that we were getting such large doses.

MR. RICHARDSON: Yes.

MR. SHEWMON: Have they replaced some of those?

MR. RICHARDSON: Yes.

MR. SHEWMON: Is there anything inherently easier about theirs with regard to closing it off?

MR. RICHARDSON: Not that I could see, but I still think some of it is in their method of measurements.

MR. KERR: I think the plant engineer -- whatever his title was -- also felt that they used less cobalt in their plant.

MR. RICHARDSON: Yes.

MR. CARROLL: I saw that in your report there. It is surprisingly low.

MR. RICHARDSON: Yes. Again, we observed there was little physical --

MR. SHEWMON: This .15 cobalt in ours -- the Canadians have been able to get low. Your nickel always has some along in it. There is also cobalt comes from wear resistant alloys and there has been efforts to try to replace and change them with only little success. My impression that a lot of it comes from the tramp that is in the stainless steel from the nickel there.

If they had really lower, for some reason they can do better than the Canadians can do or a lot better than we have done on that, I guess. It's what is in the stainless steel --

MR. RICHARDSON: I don't know. In the control room we saw what I would call an SPDS system, a computer display of their safety parameters, although they told us that SPDS was not duplicated in their offsite facility. It was only in --

MR. SHEWMON: By the operators -- or didn't they get into that kind of detail.

MR. RICHARDSON: Yes, their operators do use it. It isn't one of their primary data sources. As we were walking through the plant we looked up and there was a pipe, and I don't know what was in the pipe nor do I know it was a safety-related pipe at all. It was a pipe carrying fluid, and in that pipe there was obviously a leak. They had taken a wooden peg and hammered the peg into the leak to stop the

leak. Just an observation.

MR. CARROLL: Good Navy damage control.

[Laughter.]

MR. MICHELSON: Back to your control room. How many operators in this plant?

MR. RICHARDSON: As I recall, I think there was three.

MR. MICHELSON: This was a larger plant?

MR. RICHARDSON: This was a VVER 1000.

MR. MICHELSON: The other one was a what power?

MR. KERR: RBMK 1000.

MR. RICHARDSON: Yes. The RBMK was --

MR. MICHELSON: Why do they need only one -- I guess just the way it is, right?

MR. SIESS: Safer plant.

MR. RICHARDSON: Yes.

MR. MICHELSON: It's easier to operate, I guess.

MR. RICHARDSON: A little anecdote that I think might give you some insight to the problems that they have, John Wooten from Westinghouse was getting rather homesick toward the end of the trip and decided -- we were scheduled to fly out on Sunday and he thought he would try to catch an airplane out on Friday night out of Moscow. He was trying to work through American Express to get his plane changed, and in Moscow the phone system couldn't accommodate him.

He just couldn't make contact with American Express, so he got to Leningrad and got out to the plant, and he asked the plant manager is there any way I can get in touch with the Moscow headquarters of American Express. The plant manager said no problem, we will use the ENS. So they did, and they couldn't raise Moscow.

[Laughter.]

He had to give up.

MR. MICHELSON: ENS, meaning some kind of emergency systems.

MR. RICHARDSON: Their emergency network system. They report happenings which I found astounding. The system was down.

In several of our talks they had been telling us about their automated chemistry control systems and were rather proud of it, and we were anxious to see it at the Zoporozhie site. So, they took us into the chemistry room where they had their in-line chemistry monitoring system. As we looked -- and it was a rather sophisticated electronic display. As we looked, we discovered that in fact they had to take grab samples and bring them to the laboratory to do the analysis, so it was hardly automated on-line.

They are interested in pursuing that. In fact, they have made further contact with Westinghouse and trying to pursue some joint venture in automated chemistry control

with Westinghouse. I asked the plant manager if they applied leak before break in any of their plants and he said no, they haven't subscribed to that yet and we are looking into it. As we got out in the plant we noticed there wasn't any pipe whip restraints in any of the plants. So, if they are applying leak before break -- I guess they are just ignoring it. They didn't even understand the concept of a pipe whip restraint. I tried my best to describe what it was, and it was unfathomable to them.

MR. MICHELSON: What did you see in this plant concerning fire protection?

MR. RICHARDSON: Much better. There was some evidence of what appeared to be some fire suppression devices.

MR. MICHELSON: You mean sprinkler heads or --

MR. RICHARDSON: Some type of deluge system, whether it was water or CO2 I don't know. I didn't ask. There was what appeared to me to be a fire suppression system in some of the rooms.

MR. MICHELSON: What was your perception of the physical separation involved in their layouts?

MR. RICHARDSON: I would liken it to pre-Appendix R plants here, older plants here, where they have had to apply the 20 foot separation but very -- we saw a lot of vital equipment, redundant vital equipment without barriers

between them with some separation.

Out of all of that, we have made some recommendations that we continue to explore. The potential for cooperating in the area of diagnostic and monitoring of water chemistry, to evaluate the proposal from Prometey which has been at least initially done, to explore and develop some joint corrosion/erosion testing and particularly in the area of diagnostics, to exchange any findings and development of new materials either in the United States or in the Soviet Union, and to exchange case studies of failures.

However, we are going out of business as soon as the Russians come here in a couple of weeks. They will be visiting the Brookhaven National Laboratory, Westinghouse, the Surry plant, the EPRI Center, General Electric in San Jose, some conversations with EPRI and Palo Alto. Then they are flying back to Chicago to visit Argon and the Dresden Nuclear Power Plant and will end up with a short meeting here in Washington.

That will be the swan song of working group ten. We are recommending that these proposals and recommendations we have be picked up by a new working group that is being formed almost as we speak. The Joint Coordinating Committee is meeting in Moscow starting Monday, and one of the proposals is to form a new working group 12 on aging. We

believe many of these follow on proposals can be picked up in this new group.

MR. MICHELSON: What was the reason why they chose Dresden to visit?

MR. RICHARDSON: They wanted a PWR and a BWR, and we showed them Surry --

MR. MICHELSON: Dresden is hardly state-of-the-art, of course.

MR. RICHARDSON: No, but they are --

MR. MICHELSON: I guess it's close to Chicago.

MR. RICHARDSON: Close to the Chicago and the Argon National Laboratory.

MR. MICHELSON: LaSalle is close to Chicago too, and some of the others.

MR. RICHARDSON: Yes. In fact, we are still looking at the possibility. In fact, Dresden is going to be in a shutdown --

MR. MICHELSON: Dresden is pretty old --

MR. RICHARDSON: --during that time, and we are looking at some alternatives.

MR. SIESS: You can get them to Braidwood and Dresden -- 20 minutes apart.

MR. MICHELSON: Yes, you can do that too. Dresden is kind of an old boiling water reactor to look at. Some people like old boilers.

MR. CARROLL: Have the Russians --

MR. SIESS: Let's hope they will all be old some day.

MR. CARROLL: The Finnish plant, have they had any catastrophic sort of erosion/corrosion related failures?

MR. RICHARDSON: Yes. In fact, you bring up a point that I wanted to mention. I was very pleased that our colleagues in Russia were very candid, at least seemed to be. They shared not only their successes and all the good things they are doing, they were quite free and open about sharing their failures and the problems they have had. I was impressed with what appeared to be a lot of candor.

MR. SIESS: Were you equally open?

MR. RICHARDSON: Of course we were.

MR. CARROLL: They have had Surry-like failures in single phase?

MR. RICHARDSON: Yes. They just recently had a rather catastrophic failure in a Finnish plant.

MR. CARROLL: Right, I am aware of that one.

MR. RICHARDSON: They shared that, and earlier failures. We understand they have had a number of corrosion type failures in submarines. They didn't go into detail on that, other than to mention that they have had some problems.

That briefly is the outcome on the experience of

working group ten. So, Chuck is going to come on and give you a broader overview as well as the details of his work.

MR. KERR: Thank you very much, Jim. We appreciate your coming down.

MR. SERPAN: I would like to give you an update on what is going on in working group three on embrittlement and annealing, and I will also give you a brief overview of the entire working group -- the cooperation that we have going on with the Russians.

[Slide.]

Working group three, the Chairman is Larry Shao. The original meeting that we had a year ago in June was headed by Guy Arlotto. We have had two meetings with working group three. The entire U.S.-USSR cooperation was initiated with a memorandum titled field of civilian nuclear reactor safety between the U.S. and USSR, and that was signed in Washington back in April of 1988.

The cooperation itself was actually implemented under this U.S. -USSR Joint Coordinating Committee for Civilian Nuclear Reactor Safety. The first meeting was in Moscow in August of 1988. Since then there have been a variety of meetings, but they have been primarily focused around June of 1989 and June of 1990 although there are a number of others.

Jim Taylor is the Co-Chairman for the U.S., and

Dr. Ponomarev-Stepnoy who is the Deputy Director of Kurchatov Institute is the Co-Chairman on the Russian side. The original working group titles are -- the first one is safety approaches and regulatory practices. The second is analysis of safety of nuclear power plants in both countries. The third is embrittlement and annealing. The fourth is fire. The fifth is modernization/backfitting.

The sixth is severe accidents, and you will hear about that today. The seventh is health effects and environmental protection. The eighth is exchange of operational experience. Ninth is diagnostics, analysis and so forth, and ten is erosion/corrosion. There is a twelfth as Jim mentioned, which being talked about now of aging. The entire subject of aging of nuclear power plants. That is to be decided on at this meeting if it is to happen.

[Slide.]

In working group three of course, we focused on annealing and embrittlement. We found out quite a few interesting things from the Russians about their plants. A little bit of background about their plants, the VVER 440 -- the early model and all of them since have six horizontal steam generators, and we believe they are probably patterned after Naval nuclear power plants. The pressure vessels all have small diameters. The reason they did that was so that they could fit them through railroad tunnels just to deliver

the things.

As a result, they have high flux and fluency on the vessel wall and, therefore, they have come up with unexpectedly high embrittlement on the vessels. The early Soviet plants did not have any surveillance in them, they didn't think they were going to have a problem, and embrittlement really didn't show up in the plants until it turned up in the Loviisa plant. After that, the Finnish very rapidly adopted flux reduction and heating of the ECCS water to maintain their situation. But, by that time, it was too late for the Russian plants.

MR. SHEWMON: Did the Fins -- they did have surveillance?

MR. SERPAN: Yes, indeed. The Finns insisted upon surveillance in their program, and that's how they found about the embrittlement in their plants. Since then the Russians have put surveillance in their plants and they have even done some flux reduction as well.

[Slide.]

The steel used by the Russians are rather different than our -- I guess it's an old steel that they found to be quite satisfactory from their practice. This composition -- basically it's a chrome moly vanadium steel, and that's for the 440. For the 1,000 megawatt newer plants they have added nickel because they have a thicker section

in the materials. By comparison the U.S. pressure vessel steels are manganese nickel moly-steels. We do not have vanadium and chromium is not a primary alloy element in our.

MR. SHEWMON: Do you have any idea how much chrome is in the VVER 440?

MR. SERPAN: I think it's about two percent. I think that's what that means.

MR. SHEWMON: The same German steel would be weighed at 12 there and you divide it by five, and you have to know that though.

MR. SERPAN: This is one --

MR. SHEWMON: Yes, but it's still that 12 chrome -- the Germans call their -- you don't know.

MR. SERPAN: I'm not sure, but it's at least two percent chrome. It's fairly high. Inlet temperature on the older 440 is 270 compared to 288, so that also contributes to the higher embrittlement that they have. Probably the most telling thing is the water gap on the 440, there is only 27 centimeters between the core and vessel compared to a typical 50 centimeters for a U.S. PWR. They have forged rings, so they have no --

MR. CARROLL: No thermal shield?

MR. SERPAN: No, I don't think so.

MR. CARROLL: Just a core barrel of some sort.

MR. SERPAN: Yes. They have forged rings, so they don't have the axial weld problem that we have.

[Slide.]

Annealing, of course, has been a big deal for the Soviets and we have heard quite a bit about that. We have heard some presentations on the actual engineering of how they have done that, but we have certainly heard a lot of the research work that has gone into establish their basis for how it happens. The old VVER-440 are being annealed. At this point, nine of them are complete. They have done the Novovoronezh 1, the Armenia 1, the Nord 1,2 and 3 from East Germany, the Kozloduy from Bulgaria, the Kola 1 and 2, and they are looking to do the -- in Czechoslovakia the Bohunice 1 and 2 and the Novovoronezh 2 and 3.

The general conditions for annealing about 150 hours at 460 degrees centigrade. I think the very first one they did was a 420, and then they jumped right up to 460. They believe they get almost 100 percent recovery. They believe that the reembrittlement rate is no higher than the initial rate, and they even have some experimental evidence that shows that with subsequent reembrittlements and annealings that the rate actually falls off and the residual falls off.

MR. SHEWMON: This is all embrittlement which is particularly sensitive to phosphorous and not to copper.

So, whether or not that is germane to our stuff is what?

MR. SERPAN: Yes. It's probably realistic. I don't think it's that far away.

MR. SHEWMON: Does it precipitate the clusters are causing it are different because one is phosphorous and one is copper rich.

MR. SERPAN: That's true. Yes, that is true. The newer steels, the VVER 1000 steels have more copper in them and they are, indeed finding that is sensitive to copper in phosphorous and copper and nickel in fact, and phosphorous is not as important.

MR. WARD: How do they measure the reembrittlement rate? Do they use samples?

MR. SERPAN: They do it in experimental irradiations, the same way that we do. They have a series of capsules and they will irradiate, and then they will pull out some specimens and test them and continue to re-irradiate and pull them out. They can do that because -- I think they can do that because they do it in open capsules. They don't have to seal them. They just expose them to the water.

What I am talking about on this rate is strictly experimental work. There is no evidence from the real vessel on the reembrittlement rates. I do have one slide or two at the end about the Nord reactors where we actually

have experimental evidence from that, and I can talk about that for a minute.

The validation that they do is either by experimental test reactor trends which I just mentioned, or they take direct hardness measurements on the pressure vessel wall on the carbon steel wall in a cabin. They lower a man in there with a hardness indenter, and he literally takes measurements. Finally, they have actually taken to remove slices of material from the pressure vessel wall and test that with specimens.

MR. SHEWMON: On the hardness test you have to push something in.

MR. SERPAN: Yes.

MR. SHEWMON: What is keeping the man from sort of just moving away; is it an impact, or does he have something inside of the vessel holding him?

MR. SERPAN: It's a two-ton cabin that is lowered in there. It's a lead shielded cabin -- a huge monster -- that is lowered in there on a crane.

MR. SHEWMON: You don't think it sways that much then?

MR. SERPAN: I don't think so. With that little bit of force, I think the reaction is pretty small. In fact, it could be braced. We didn't ask that question.

[Slide.]

The working group program for 1990 and 1991 has been to exchange and irradiate vessel steels. We will send some of our steels to them, they have already started to send some of their steels to us. We will irradiate them in each other's reactors and test them and then compare them against our own experience so that we have a better feel for how their results compare to ours and likewise.

We are going to exchange fractured toughness databases. We think that will be very interesting and important. The Russians are extremely interested in studying materials from the Novovoronezh reactor which has been taken out of service. They will send us some very small samples for microscopic study by Bob Odette at the University of California, Santa Barbara. They are going to try to get some out of the Armenian reactor as well for that study.

MR. SHEWMON: Is the Armenian reactor even started up?

MR. SERPAN: No. What this tells me is that they have decided to terminally shut that down and cut it up, although we didn't explicitly hear about that. They volunteered that material, so that must be the case.

A year ago -- this is a little bit out of the working group three how it came up, but we put it into the program. Some Russians came to the U.S. and mentioned that

they have taken virtually 1,000 measurements of stress and temperature on the nozzle ring on the upper head of a VVER 1000 plant. They have offered those measurements to us in exchange for us making a calculation -- a regular design stress analysis of that vessel. Then we would have the temperatures and stress measurements to actually see how it comes out. We are in the process of trying to get that information from them so that we can do that study.

Vessel failure probability has been interesting. That part has been finished now. We have exchanged reports on vessel failure risk analyses; we understand how they did theirs and we understand how we did ours. Actually we did once case, I think it was the H. B. Robinson HYPO case. Yes, that's what it was. Although there were some differences throughout, in general, it was very good. The different answers for the different transients were really quite good. We understand we think why the ones that were not very close, why they came that way. We believe we have gone about as far as we can on that.

We are exchanging vessel integrity reports similar to what we have done on Oak Ridge similar to the ITV series. The Russians are interested in exchanging data on the inhomogeneity of materials. I think it is very important. We have some older information that we will exchange with them.

In the vessel failure probability stiff, thermal mixing models came up. There was quite a bit of talk how we do that and how the codes work. Dr. Theofanous was with us at that time, and he got into the conversations. What came out of that is that we will send them three or four of our benchmarks like the CREARE, half-scale, Purdue and so forth, for them to calculate and then compare with the actual benchmark numbers. And we will look at -- I will get to it -- we will look at their VVER 1000 full scale model and see how that comes out.

MR. SHEWMON: The inhomogeneity is between center and surface, or what?

MR. SERPAN: Yes. The through thickness in homogeneity and materials and the properties coming therefrom.

MR. SHEWMON: This is heat treated, so it get into changes in microstructure from transformation rate.

MR. SERPAN: Yes. That's exactly what they are interested in. The one issue in this working group that is probably of the most interest to the U.S. is in-situ vessel annealing. In addition to the research work that they have talked to us about, they have given us some information on how the have done it. I have a little slide -- I think the next slide -- to give you just a little idea of it.

What it is going to give us is the ability to

visit the next annealing that they do which will probably be the Novovoronezh 3 next spring. We can send a team there and witness that annealing for the three weeks that they claim it takes them to do. The have it down to three weeks. We should be able to send some people there and actually see how they do this.

Finally, the Soviets have proposed that a scientist be sent to work with Bob Odette for a couple of months, and I think we agree with that. That will probably happen.

MR. CARROLL: I misread that quote. I thought they were going to provide a scientist to the UC Santa Barbara that lacks that kind of talent in general.

MR. SERPAN: No, not quite.

[Slide.]

This is what a VVER 440 looks like. The brown is the pressure vessel wall. As you may recall, they have a double ring nozzle because they have so many inlets and outlets. They lower a heating element in here that has all of these electrical resistance heaters in here at the central section where they want to anneal. They simply lower it down into the pressure vessel like this and they heat it up.

MR. CARROLL: How many megawatts of heat do they apply?

MR. SERPAN: I don't know. This is the temperature distribution that they get. This curve here, number one, is initially -- and this is the steady state. So you see, they have a big gradient in temperature. This is 100 C and this is up to 500 or so C here. It's a big gradient that they have. However, by the time that they get to the nozzle ring you see, they have gotten down quite a bit. So they are maybe only 250 degrees centigrade. That is not really bad.

The U.S. reactors on the other hand, would have to have this heating element virtually up at the ring level. That's a problem that we have. For them, it's fairly favorable.

MR. SHEWMON: What are the vertical units of dimension there?

MR. SERPAN: The vertical units -- millimeters.

MR. SHEWMON: Is that what it is? It can't be one millimeter.

MR. SERPAN: No.

MR. SHEWMON: It could be meter.

MR. SERPAN: It's 6.3 and one-half meters.

MR. SHEWMON: I see, you are over there. I was looking on the right on the graph.

MR. SERPAN: Here, I don't know what those are. I think these are meters. They correspond directly here --

it's a one-to-one correspondence here.

[Slide.]

Greifswald -- there was a meeting in Cologne after we went to Prometey laboratory about the East German reactors. They have annealed the first three reactors 460 centigrade, 150 hours. They have done the validation by direct hardness measurements, and then mechanical property tests on number one They have actually taken material out of number one, pre and post-anneal and the post-anneal they have already looked at -- they have measured with subsize Charpy and through correlations plus 35 degrees centigrade. I guess they probably had irradiated over 200 degrees centigrade, so they have a lot of recovery.

MR. SHEWMON: What are you referring to blocks one and two?

MR. SERPAN: The Germans call units, they call them blocks. That's unit one and two and three, that's all. They did do that annealing.

[Slide.]

We visited, as Jim said, we visited the Prometey Institute in Leningrad and had a good tour of that. We found it to be very interesting. They have good equipment. They don't have a lot of equipment. The good stuff that they do have seems to be from West Germany, shank equipment or Finnish equipment. The Russian equipment that we saw --

I don't recall seeing it, to be honest with you.

They use Western strain gages and a minimum amount of instrumentation in their tests. They are good theoretical people and they work hard at this stuff, but I would call it very ordinary laboratory by U.S. standards. That is my opinion. The things that we saw them working on were fracture toughness, Charpy-V kinds of tests, tensile, fatigue, creep, high temperature, liquid metal work and environmental conditions.

Structural integrity tests were certainly impressive enough, model vessels and pressurized thermal shock. I must say the pressurized thermal shock test was pretty crude. I am not sure that I would really believe the numbers that came from that. In their hot cell work -- and we were the first Westerners ever to get in their hot cell facilities and that was kind of interesting -- we saw fracture toughness work, Charpy-V, tensile, annealing work and they had the capability for machining specimens as well.

MR. SHEWMON: When you say fracture toughness, that's LEFM and the Charpy-V is --

MR. SERPAN: Yes. They have compact tension. They can literally do compact tension up to one T work.

MR. MICHELSON: What kind of hot cell facilities did they have?

MR. SERPAN: I think it was a dozen hot cells, and they were very nicely equipped. They had all the equipment that you need for these tests, as well as for taking chunks of steel as for the Novovoronezh and machining those down into test specimens and making the tests. They were perfectly adequate hot cells.

MR. MICHELSON: They had 12 of them?

MR. SERPAN: Yes, they had 12 of them, yes. I have taken more time than I should. Are there any questions?

[No response.]

MR. KERR: Thank you very much, Chuck.

MR. SHERON: My name is Brian Sheron, Director of Division Assistance Research in RES. I will talk to you very briefly about working group six, which is entitled severe accidents.

[Slide.]

This was my first meeting as Chairman for U.S. side for working group six. Dr. Speis chaired it previously. I was not involved in the first meeting which was held in June of 1989 here, in the U.S. when a Soviet delegation came here. My understanding from Dr. Speis is that the meeting was principally exploratory and there was a fair amount of information exchange on source terms at that meeting.

We also learned at that time that the Soviets had considerable amount of experience with hydrogen behavior, and this is an area in which we are pursuing further which I will get to. The second meeting of working group six was held the week of June 20 through 30 in Moscow. I attended along with Dr. Kerr, Professor Theofanous from UCSB, Paul North from EG&G, I Idaho and Fred Harper from Sandia National Laboratories.

The scope of our discussions for this working group were expanded to beyond severe accidents. This was by agreement with the Joint Coordinating committee, and they included not only severe accidents but also thermal hydraulics -- and I didn't even put it down here -- accident management, and PRA.

[Slide.]

I will just try and quickly hit on the highlights of our meeting. In the area of thermal hydraulics, we visited as Jim Richardson said, Electrogorsk which was something on the order of 40 or 50 miles east of Moscow where Nigmatulen has his heat transfer facility. What we saw there was a sort of like semiscale. It was a one to three thousand volume scaled facility, full height, full pressure. As you can tell, it was tall and skinny. It has 1.8 megawatts max electric power. Interesting, it had a separate downcomer like the last semiscale version did, and

it also had a separate upper plenum and upper head.

We were able to kind of climb up and walk around and poke our nose around it. I think our conclusion was that it was a rather crude version of semiscale. It didn't seem to have a lot of the instrumentation that semiscale had, and we kind of pushed them on the heat loss question which was a big issue in semiscale. I guess my reaction is that they kind of waved their arms and said they had it taken care of, but they really didn't go into any detail on it.

[Slide.]

Just quickly, this is what it looks like. For those of you who remember semiscale, I am sure it looks pretty much the same. This is the downcomer right here, this is the core region. You can see they have this separate upper head/upper plenum region here which I guess in my experience, it is going to give them a lot of trouble with flow in that area. Ernie, I am sure you are familiar with that.

We sort of mentioned it to them, but we didn't carry on about it excessively on all the grief we had with semiscale in that area. We certainly offered to talk to them about it, but I think they are going to learn themselves the hard way when they run this thing.

[Slide.]

With regard to their analytic capability, right now I don't really have any knowledge of any thermal hydraulic code that they are using specifically. They have RELAP, they have it through the IAEA. I think RELAP Mod 1 was released several years ago to IAEA. What we did propose to them and they were very anxious, was to join the ICAP program, the International Code Assessment Program. If you recall, what that is, we have a number of foreign countries which, in return for receiving our thermal hydraulic computer codes along with the updates and the research results that we do, they provide with code assessments and many times they identify code errors or even improvements that they have made to the code which we ultimately adopt.

The agreement was signed on June 30th which was the closing at our meeting with a formal signing ceremony, so they are now officially members of ICAP. Once we returned in early July we shipped over to them about three boxes full of tapes which was the RELAP 5 Mod Code, the TRAC PF1 Mod 2, I think TRAC BD 1 and Cobra NC which is the standard package.

MR. SHEWMON: What do they have for machines to run them on? I know the U.S. has done their best to keep them from having anything better than PC's.

MR. SHERON: That's interesting that you would mention that. I really didn't put it in my viewgraphs. If

you remember, right about the same time in the summer that we were over there, Mr. Gorbachev was visiting the U.S. and signed an agreement with Control Data to purchase I think it was eight or so large CDC machines. These are now in the process of being delivered by CDC to various laboratories and locations in the Soviet Union.

They do have license controls on them, in the sense that they are only allowed to run certain kind of problems and I believe CDC has them fixed so that they can go over and check and make sure they are not running bomb calculations or something. I have been approached by Control Data -- as a matter of fact when we were over there I was called out of our meeting to go and sit in a meeting in which Control Data was making a sales pitch to Mr. Velakov who is the head of the Kurchatov laboratory and a very high official.

They were very interested in learning very quickly what codes we were providing to the Soviets because they obviously wanted to make sure that whatever machine they were sending over that these machines would be able to accept and run these codes. Since then I have had two meetings with Control Data, the latest one being yesterday morning in which we have explained to them which versions of the codes have been provided to the Soviets. They are now scratching their head trying to figure out as part of this

package sale that whether they are going to provide the services to convert these codes over to the CDC language or not.

I kind of said that's their business. We didn't really agree to provide any conversion.

MR. SHEWMON: Run four TRAN 77 or whatever is the standard.

MR. SHERON: I imagine they all run four TRAN, but it's the compilers that are different. I'm not going to claim to be a computer expert. It is basically converting it into the machine language where there is a lot of problems usually.

I would also reemphasize what Mr. Richardson said, because yesterday Mr. Adamov visited with the Control Data people. He is the Director of the Institute for Atomic Power I believe it is in Moscow which is part of the Ministry, and I think Kurchatov somewhere under them in the bureaucracy. He was basically complaining to me that, why should we be providing these codes to Kurchatov when they are really the people that do the safety calculations in the Soviet Union and we should really be dealing with them. I tried to very diplomatically explain that I was under instructions that we had a deal through our Joint Committee and Kurchatov was the designated organization on the Soviet side.

This is just another example of their bureaucracy and how organizations just don't talk to one another over there.

MR. KERR: That sounds like the U.S., doesn't it?

MR. WILKINS: It does sound like that to me.

MR. SHERON: What else is new. We had an ICAP meeting -- our semi annual ICAP meeting scheduled right after the Water Reactor Safety Meeting in two weeks. There is a delegation of eight Soviets coming over headed by Vladimir Asmalov, who is the director of the Division of Reactor Safety at Kurchatov who reports to Dr. Ponomarev-Stepnoy. He will be heading up that delegation.

Part of them will be attending the ICAP meeting for the first time. We also have our cooperative severe accident research meeting, and some will be attending that.

[Slide.]

In the area of severe accidents, we had a number of discussions in the area of hydrogen. They talked to us about some experiments that they had done. They have also done some core concrete interaction work. They have a code called ROSPLOV, which I think I showed once before to the Committee the results of ISP-24 which was their prediction of our SRK 4 experiment.

They presented a bunch of papers on this. It was

kind of raggedy ann because of the translation that was going on, combined with the fact that the translators were not technical. There was one translator that was actually kind of asked to leave and we had to get another one half way through because he just couldn't understand the technical interpretation.

One of the things that the Soviets did do is, they had a number of potentially useful testing facilities in core concrete and one which I am very interested in and I hope I can pursue it when they are here in two weeks -- some facility they described in which they claim they have the capability to test the interaction of a lower head with molten corium. If I interpreted what they said correctly. I would like to really find out more what that is capable of.

We had very little detail though on a lot of their facilities, and I think the next step in our interactions with them is going to be to learn more about these facilities. We did receive a number of reports that were in Russian. I have sent them out to be translated and I have only gotten a few back. That does take time.

We also proposed that it might be beneficial in terms of our working relationship for them to join our Cooperative Severe Accident Research Program. Basically, this is similar to ICAP in which in return for either a

certain amount of money or for in kind research of at least some minimum value, we will provide them the results of our research as well as our severe accident codes.

When we came back -- one thing we did when we were there is try and ascertain what kind of research they were doing and basically how much they were investing. They told us it was about 30 million rubles which I think was around $5 million.

[Slide.]

Based on that, when we came back, we spent the next several months iterating an agreement which hopefully will be signed next week by Mr. Taylor when he's over there. As you know, these agreements have to go through the State Department and everybody gets their chance to noodle them. It's a real fun time trying to get something put together. We think we have something that can be signed next week.

In anticipation of that, the Soviets will be attending our Semi Annual Severe Accident Cooperative Program which will be held Thursday and Friday after the Water Reactor Safety Meeting. The agreement right now basically says that we will give you what we have, you give us what you have. So, they are basically on the agreement to give us the results of their severe accident research that they are conducting in their Country right now.

Group six is scheduled to hold a short -- by short

I mean one-half day meeting -- on Tuesday, October 23. This is during the Water Reactor Safety Meeting. I think that during that meeting our agenda is going to be kind of limited to first going through the mechanics of joining the Cooperative Severe Accident Program; how we carry that out. We will also probably discuss in detail some of the agenda items that we want to put on our larger meeting which we will hold the following spring and then probably touch base on a few of the open ends that we had in the other meeting like in the hydrogen area.

The delegation has also asked to visit Sandia. There are eight of them, and they are all going out to Sandia on Sunday the 28th. They will visit Sandia on the 29th which is Monday. Three of the Soviets, Asmalov, his deputy Shak and Mr. Sukaruchkin who is the international type coordinator there, they are going to travel on to EPRI to the ACE Board Meeting which is on Tuesday, Wednesday and Thursday I believe. The other five Soviets will fly back to Washington and return to the Soviet Union.

After the ACE Board Meeting, as long as they are on the West Coast, they have been invited down to UCSB to visit Professor Theofanous' laboratory on November 2nd. I think on that Saturday they will fly back to New York and return to Moscow.

Our next meeting with them is tentatively

scheduled in Moscow next summer.

[Slide.]

MR. SHEWMON: What is the ACE Board Meeting?

MR. SHERON: ACE is the Advance Containment Experiment, which is basically the core concrete. It's a cooperative arrangement which EPRI is sponsoring and the Soviets are members of.

In the area of PRA, my impression was that the Soviets really haven't done too much in this area. As I understand it, they have done some limited work in looking at risk of certain systems and so forth. They did not appear to give us any information on any full scope PRA's that they have done. I think they indicated they are either working on one or plan to start one.

We gave them Fred Harper from Sandia, gave them a rather lengthy discussion on 1150 and what we did and what it concluded. At the close, we concluded that we would assist them and review any PRA that they had conducted and so chose to provide to us.

That's basically in a nutshell what we did over there and the areas that we touched upon. As I said, we have expanded the role of the group from just severe accidents. We also talked about accident management. I didn't really mention it here because the Soviets gave a number of papers on what they called accident management and

it was not accident management as we define it. Their accident management appeared to be basically analysis or calculations of accidents, but certainly not from the standpoint of actively looking at how an operator interacts with the system during an accident and the like.

We presented -- Paul North presented some presentations on accident management. I think our only objective there was only maybe sensitize them to the issue and maybe get them thinking about it. They are not doing very much in that area right now.

MR. CARROLL: Not since Chernobyl?

MR. SHERON: That's right.

MR. WILKINS: Brian, you mentioned Control Data. Were any of its commercial competitors interested in these codes? I suppose IBM is not worried about the problem, but how about anybody else?

MR. SHERON: I have not been approached by anyone else. The person that Control Data has hired to sort of interface in this area is Dick Kern who some of you may remember worked on ECCS back in the 1970's. He worked back when Zoltan was chief of analysis. We had some subcontracts with them. He understands the code area.

We have had no requests at all. One thing they were interested in is the -- Control Data wanted to provide them with sort of a suite of codes that they could run on

these computers, you know, sort of like you buy a new car and you get a demonstration tape to put in the tape players. They wanted to give them a suite of codes. They approached me several months ago about that. I declined to offer them any fixed suite of codes. I said that any safety codes that they might want to find that are releasable overseas would come out of the Argon Code Center, The National Software Center that are marked for unlimited distribution.

I didn't want to give them any specific code names and said these are the ones that we would recommend. I don't think they really pursued that, because right after that was when they joined ICAP and we all of a sudden had a suite of codes that we gave the Soviets. So, Control Data came over and said can we get that suite of codes. I said yes, you -- it's publicly available to domestic users and the like, and since we have given it to the Soviets as long as you all agree not to give it to anyone else other than the Soviets we don't have any problem.

That's where we left it right now with them.

MR. KERR: Are there other questions?

[No response.]

MR. KERR: Thank you very much, Brian. I appreciate the presentation. It was very informative. Mr. Chairman, that concludes this session.

MR. MICHELSON: Thank you. We will take a break

now until 2:45.

[Whereupon, at 2:30 p.m., the transcribed portion of the Subcommittee meeting concluded.]

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This is to certify that the attached proceedings before the United States Nuclear Regulatory Commission

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10 CFR PART 50 - APPENDIX B

"QUALITY ASSURANCE CRITERIA FOR NUCLEAR POWER PLANTS AND FUEL REPROCESSING PLANTS"

QUALITY ASSURANCE REGULATORY GUIDES

SRP 17.1 DESIGN & CONSTRUCTION			SRP 17.3 GENERAL	
1.28	QA PROGRAM	N-45.2	1.28	NQA-1
1.58	INSPECTORS	N-45.2.6		
1.64	DESIGN	N-45.2.11		
1.74	DEFINITIONS	N-45.2.10		
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1.123	PROCUREMENT	N-45.2.13		
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1.146	AUDITORS	N-45.2.23		
1.30	ELECTRICAL	N-45.2.4	1.28	NQA-2
1.37	CLEANING	N-45.2.1		
1.38	HANDLING	N-45.2.2		
1.39	HOUSEKEEPING	N-45.2.3		
1.94	STRUCTURAL	N-45.2.5		
1.116	MECHANICAL	N-45.2.8		

QUALITY ASSURANCE REGULATORY GUIDES

SRP 17.2 OPERATIONS			SRP 17.3 GENERAL		
1.33	ADMIN QA PROGRAM INSPECTORS DESIGN DEFINITIONS RECORDS PROCUREMENT AUDITING AUDITORS	ANS-3.2	1.33 1.33	ADMIN NQA-1	ANS-3.2
1.30	ELECTRICAL	N-45.2.4	1.33	NQA-2	
1.37	CLEANING	N-45.2.1			
1.38	HANDLING	N-45.2.2			
1.39	HOUSEKEEPING	N-45.2.3			
1.94	STRUCTURAL	N-45.2.5			
1.116	MECHANICAL	N-45.2.8			

1984 NRC STUDY INDICATED

QA SHOULD FOCUS MORE ON

PERFORMANCE

PERFORMANCE-BASED QA TRAINING

A. WITHIN NRC

- 23 SESSIONS
- 489 PERSONNEL

B. WITHIN INDUSTRY

- ABOUT 30 UTILITIES
- ABOUT 50 PLANTS

NRC INSPECTION PROCEDURE REVISIONS:

A. "INSPECTING OF QUALITY VERIFICATION FUNCTIONS" (IP 35702)

B. "LWR INSPECTION PROGRAM FOR PLANT OPERATIONS" (MANUAL CHAPTER 2515)

STANDARD REVIEW PLAN

REVISION OF CHAPTER 17

"QUALITY ASSURANCE"

THE ACCEPTANCE CRITERIA OF SRP SECTIONS 17.1 & 17.2 ARE PROGRAM ORIENTED -

IN ACCORDANCE WITH THE 18 CRITERIA OF APPENDIX B

THE ACCEPTANCE CRITERIA OF SRP SECTION 17.3 ARE PERFORMANCE ORIENTED -

A. MANAGEMENT

B. PERFORMANCE/VERIFICATION

C. SELF-ASSESSMENT

SRP SECTION 17.3 LEADS TO A MORE PERFORMANCE-BASED QA PROGRAM DESCRIPTION AND, THEREFORE, TO THE IMPLEMENTATION OF A MORE PERFORMANCE-BASED QA PROGRAM

SRP SECTION 17.3:

1. REQUIRES NO NEW STAFF POSITIONS
2. IS NOT A BACKFIT
3. ELIMINATES FRAGMENTATION AND OVERLAP
4. SIMPLIFIES, CLARIFIES, AND CONSOLIDATES TEXT
5. USES UP-TO-DATE INDUSTRY CONSENSUS STANDARDS
6. EMPHASIZES A GRADED APPROACH TO QA
7. IS LESS PRESCRIPTIVE THAN 17.1 & 17.2

IMPLEMENTATION OF SRP SECTION 17.3:

1. "NOTICED" IN FEDERAL REGISTER 8/90
2. ISSUED INTERNALLY 8/90
3. DEVELOP REVIEWER TRAINING
4. TRAIN REVIEWERS
5. INFORM INDUSTRY
6. REVISE STANDARD FORMAT (R.G. 1.70)

USAGE OF SRP SECTION 17.3:

1. DOE USES NQA-1 AND NQA-2
2. SEVERAL UTILITIES HAVE ALREADY GONE TO A QAPD FORMAT MORE IN-LINE WITH 17.3
3. AT LEAST ONE UTILITY HAS COMMITTED TO MEET NQA-1 AND NQA-2 INSTEAD OF N-45.2 AND ITS DAUGHTER STANDARDS

SECTION 6 OF THE STANDARD TECHNICAL SPECIFICATIONS IS BEING REVISED AS PART OF THE NEW STANDARD TECHNICAL SPECIFICATIONS PROGRAM

SECTION 6 HAS SEVERAL ASPECTS THAT COMPRISE MAJOR ASPECTS OF SELF-ASSESSMENT

SECTION 6 IS BASED ON SECTION 13.4 OF THE SRP

CURRENT SECTION 6.0 ASPECTS OF SELF-ASSESSMENT

1. SECTION 6.2.3 - INDEPENDENT SAFETY ENGINEERING GROUP (ISEG)
2. SECTION 6.5 - REVIEW AND AUDIT
   a. 6.5.1 - UNIT REVIEW GROUP (URG)
   b. 6.5.2 - COMPANY NUCLEAR REVIEW AND AUDIT GROUP (CNRAG)

HAS RESULTED IN DISCONNECTED PROGRAMS WITH OVEREMPHASIS ON STRUCTURAL ASPECTS

REVISED SECTION OF THE NEW STANDARD TECHNICAL SPECIFICATIONS (RELABELED SECTION 5.5)

SECTION 5.5 - REVIEW AND AUDIT

1. SECTION 5.5.1 - PLANT REVIEWS
2. SECTION 5.5.2 - OFFSITE REVIEW AND AUDIT
   a. REVIEW RESPONSIBILITIES
      SAME AS OLD CNRAG
   b. AUDIT RESPONSIBILITIES
      SAME AS OLD CNRAG
   c. TECHNICAL REVIEW RESPONSIBILITIES

INTENDED RESULT OF REVISED SECTION 5.5

1. INTEGRATE SELF-ASSESSMENT ACTIVITIES INTO AN INTEGRATED PROGRAM
2. DEEMPHASIZE STRUCTURAL ASPECTS
3. MORE FLEXIBILITY

REVISED SECTION 5.5 HAS BEEN DISTRIBUTED TO THE OWNERS GROUP

SECTION 13.4 OF THE SRP TO BE REVISED

NRR STAFF PRESENTATION TO THE ACRS

(2)

SUBJECT: JCCCNRS WORKING GROUP 10
VISIT TO THE USSR - JUNE 1990

DATE: OCTOBER 5, 1990

PRESENTER: J. E. RICHARDSON

PRESENTER'S TITLE/BRANCH/DIV: DIRECTOR, DIVISION OF ENGINEERING TECHNOLOGY, NRR

PRESENTER'S NRC TEL. NO.: 301 - 492-0722

SUBCOMMITTEE: FULL COMMITTEE

JCCCNRS

WORKING GROUP 10

"EROSION/CORROSION OF PIPING AND COMPONENTS"

DECEMBER 1988	MOSCOW
JUNE 1989	WASHINGTON
JUNE 1990	USSR
OCTOBER 1990	USA

WORKING GROUP 10

JUNE 1990

MEETING TOPICS

- WATER CHEMISTRY REGIMES FOR PRESSURIZED WATER AND BOILING WATER REACTORS

- SEPARATION AND TRANSPORT OF CORROSIVE PRODUCTS

- NON-DESTRUCTIVE EXAMINATION TECHNIQUES FOR MONITORING DEGRADATION OF COMPONENTS DUE TO EROSION AND CORROSION

WORKING GROUP 10

LABORATORY AND PLANT VISITS

- ALL UNION SCIENTIFIC RESEARCH INSTITUTE OF NUCLEAR POWER AT ELECTROGORSK
- RESEARCH AND DEVELOPMENT INSTITUTE OF POWER ENERGY AND SCIENCE, MOSCOW
- KURCHATOV ATOMIC ENERGY INSTITUTE
- ALL UNION SCIENTIFIC RESEARCH INSTITUTE OF ATOMIC MACHINE BUILDING, MOSCOW
- CENTRAL RESEARCH INSTITUTE OF STRUCTURAL MATERIALS, "PROMETEY," LENINGRAD
- LENINGRAD 1 NUCLEAR POWER PLANT
- ZAPOROZHIE NUCLEAR POWER PLANTS

(3)

US–USSR Cooperation

Working Group 3

"Radiation Embrittlement of the Housing and Support Structures and Annealing of the Housing"

L. C. Shao, Co-Chairman

Presented to

Advisory Committee on Reactor Safeguards

October 5, 1990

US–USSR COOPERATION

- Cooperation Initiated per:
  Memorandum of Cooperation in the Field of Civilian Nuclear Reactor Safety between the US and USSR, Washington, D.C., 28 April 1988
- Cooperation Implemented per:
  US–USSR Joint Coordinating Committee for Civilian Nuclear Reactor Safety (JCCCNRS); first meeting, Moscow, August 22–24, and 31, 1988
- Co-chairmen: J. M. Taylor, USNRC and N. N. Ponomarev-Stepnoy, Kurchatov Institute of Nuclear Energy
- Titles of Original Working Groups
  1. Safety Approaches and Regulatory Practices
  2. Analysis of the Safety of Nuclear Power Plants in the USSR and the US
  3. Radiation Embrittlement of the Housing and Support Structures and Annealing of the Housing
  4. Fire Safety
  5. Modernization/Backfitting
  6. Severe Accidents
  7. Health Effects and Environmental Protection Considerations
  8. Exchange of Operational Experience
  9. Diagnostics, Analysis Equipment and Systems for Supporting Reactors
  10. Erosion/Corrosion Destruction of Piping and Components

(3)

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US–USSR COOPERATION

Background on Reactors

- VVER–440 early PWR model
  440 MW(t), 6 horizontal steam generators probably patterned after naval nuclear units
- Pressure vessel small diameter; sized to fit RR tunnels
- High flux and fluence on vessel wall
- Unexpectedly high embrittlement of vessels
- No surveillance in early Soviet plants
- Initial embrittlement information from Finnish Loviisa–1
- Finns adopted flux reduction and heating of ECCS water in early 1980s to maintain acceptable RT–NDT and prevent PTS accidents
- Flux reduction too late for many Soviet plants – Annealing adopted

US-USSR COOPERATION

Background on Reactors

- Pressure Vessel Steels
  - VVER-440 15Cr2MFA Cr-Mo-V
  - VVER-1000 15Cr2NMFA Cr-Mo-Ni-V
    - P typically > 0.025; Cu nominal 0.10-0.12
  - US forging A508 Cl 2 Mn-Ni-Mo
  - US plate A533-B Mn-Ni-Mo
    - Cu can be > 0.30, Ni > 0.5
- Inlet Temperature on Vessel
  - VVERs 270 C
  - US PWRs 288 C
- Core to Vessel Water Gap / Vessel Diameter and Thickness

	Core to Vessel Water Gap	Vessel Diameter	Thickness
VVER-440	27 cm	350 cm	14 cm
VVER-1000	39 cm	400 cm	19 cm
US PWR	50 cm	440 cm (1000 MW)	21 cm

- Forged Rings - No Axial Welds
  - VVER-440 Circumferential welds below core centerline
  - VVER-1000 Circumferential welds at top and bottom of core
  - US PWR Axial welds, circumferential welds near core centerline

US–USSR COOPERATION

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  US PWR Axial welds, circumferential welds near core centerline

US–USSR COOPERATION

Soviet Annealing

- Old VVER-440s being annealed
  9 annealings complete, as of 7/90
    - Novovoronezh-1
    - Armenia-1
    - Nord-1, 2, 3 (GDR)
    - Kozloduy-1, 3 (Bulg.)
    - Kola-1, 2

      Planned
    - Bohunice-1, 2 (CSSR)
    - Novovoronezh-2, 3
- Conditions
  time – about 150 hours
  temperature – 460 C
- Recovery
  Reported to be essentially 100%
- Reembrittlement
  Rate reported to be no higher than initial
- Validation
  Experimental test reactor trends
  Direct hardness measurements from manned "cabin" lowered into vessel
  Sub-size Charpy-V specimen tests of annealed material removed from the pressure vessel wall

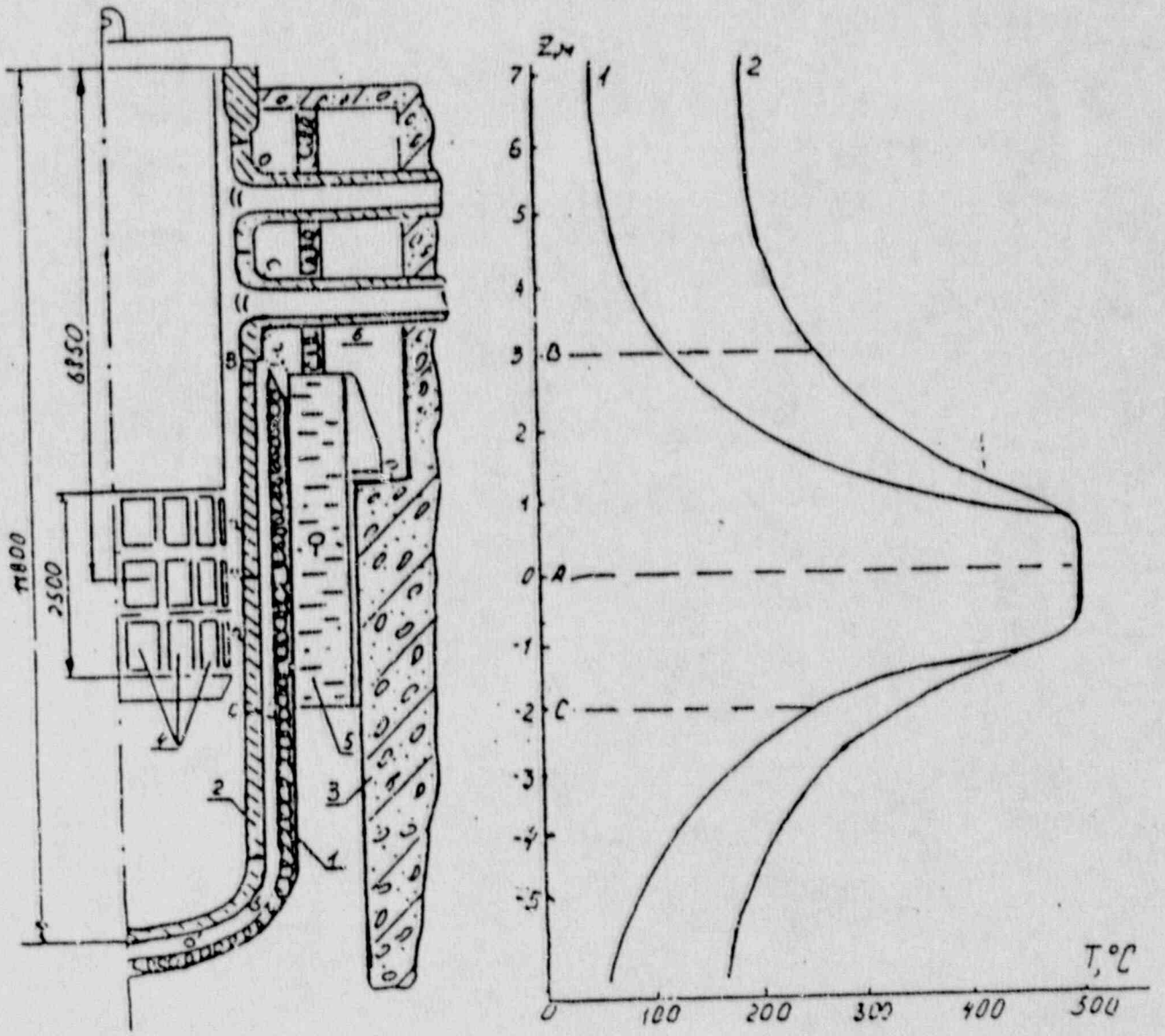

Fig. 1. Diagram of annealing of reactor vessel.
Fig. 1a. Sketch of the reactor vessel with heating arrangement and the pit volume: 1 - thermal insulation; 2 - reactor vessel; 3 - structural concrete; 4 - electric heaters; 5 - annular tank with water; 6 - supporting ring; 7 - thermocouple.
Fig. 1b. Distribution of temperature along the height of the vessel: 1 - instant of establishment of holding stage; 2 - end of holding stage.

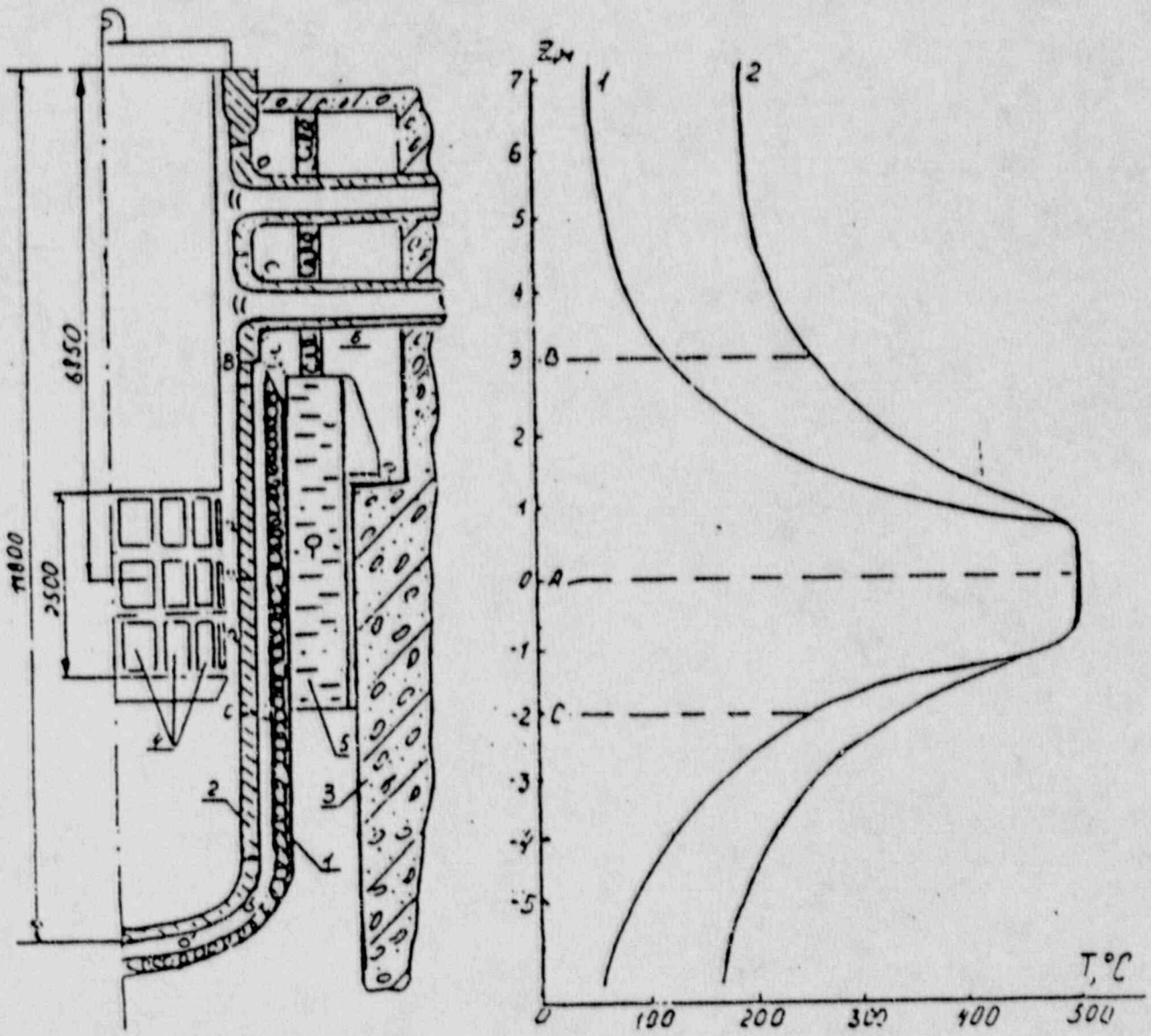

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Fig. 1b. Distribution of temperature along the height of the vessel: 1 - instant of establishment of holding stage, 2 - end of holding stage.

JCCCNRS WG-3 PROGRAM 1990-1991

- Exchange and irradiation of vessel steels
- Exchange fracture toughness data bases
- Study of irradiated materials from Novovoronezh and Armenian reactors for US study
- VVER vessel stress analysis validation
- Vessel failure probability
- Exchange of vessel integrity reports
- Exchange of data on inhomogeneity of materials
- Thermal mixing models
- In-situ vessel annealing
- Soviet scientist to UCSB (proposed)

GREIFSWALD (NORD) REACTORS

Blocks 1-4 VVER-440 PWRs

- Blocks 1, 2 no clad
- Blocks 3, 4 cladding

Annealing 460 C, 150 h

- Blocks 1, 2, 3

Validation

- Direct hardness measurements, unclad
- Mechanical property tests on material removed from vessel wall

NORD-2, 3

- Material removed post-anneal

NORD-1

- Material removed pre- and post-anneal
- Annealed material TT = +35 C @ 35 ft-lb
- Soviet prediction TT = +66 C @ 35 ft-lb

GREIFSWALD (NORD) REACTORS

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- Soviet prediction TT = +66 C @ 35 ft-lb

PROMETEY INSTITUTE, LENINGRAD

STRUCTURAL MATERIALS DEVELOPMENT

- MECHANICAL PROPERTIES
  - Fracture toughness - Charpy-V
  - Tensile
  - Fatigue
  - Creep
  - High temperature
  - Liquid metal
  - Environmental conditions

- STRUCTURAL INTEGRITY TESTS
  - Model vessel
  - PTS

- IRRADIATION EFFECTS
  - Fracture toughness - Charpy-V
  - Tensile
  - Annealing parameters

(4)

SUMMARY OF ACTIVITIES

JCCCNRS WORKING GROUP 6

SEVERE ACCIDENTS

U.S. CHAIRPERSON

BRIAN W. SHERON

- First meeting held June 1989 in U.S.

- Mostly exploratory discussions on U.S. and U.S.S.R. programs.

- Information exchanged on source terms.

- Appeared U.S.S.R. had considerable experience and experimental capability with hydrogen behavior.

- Second meeting held in Moscow (Kurchatov Institute) June 20 - June 30, 1990.

- Scope of discussions expanded to include thermal-hydraulics and PRA.

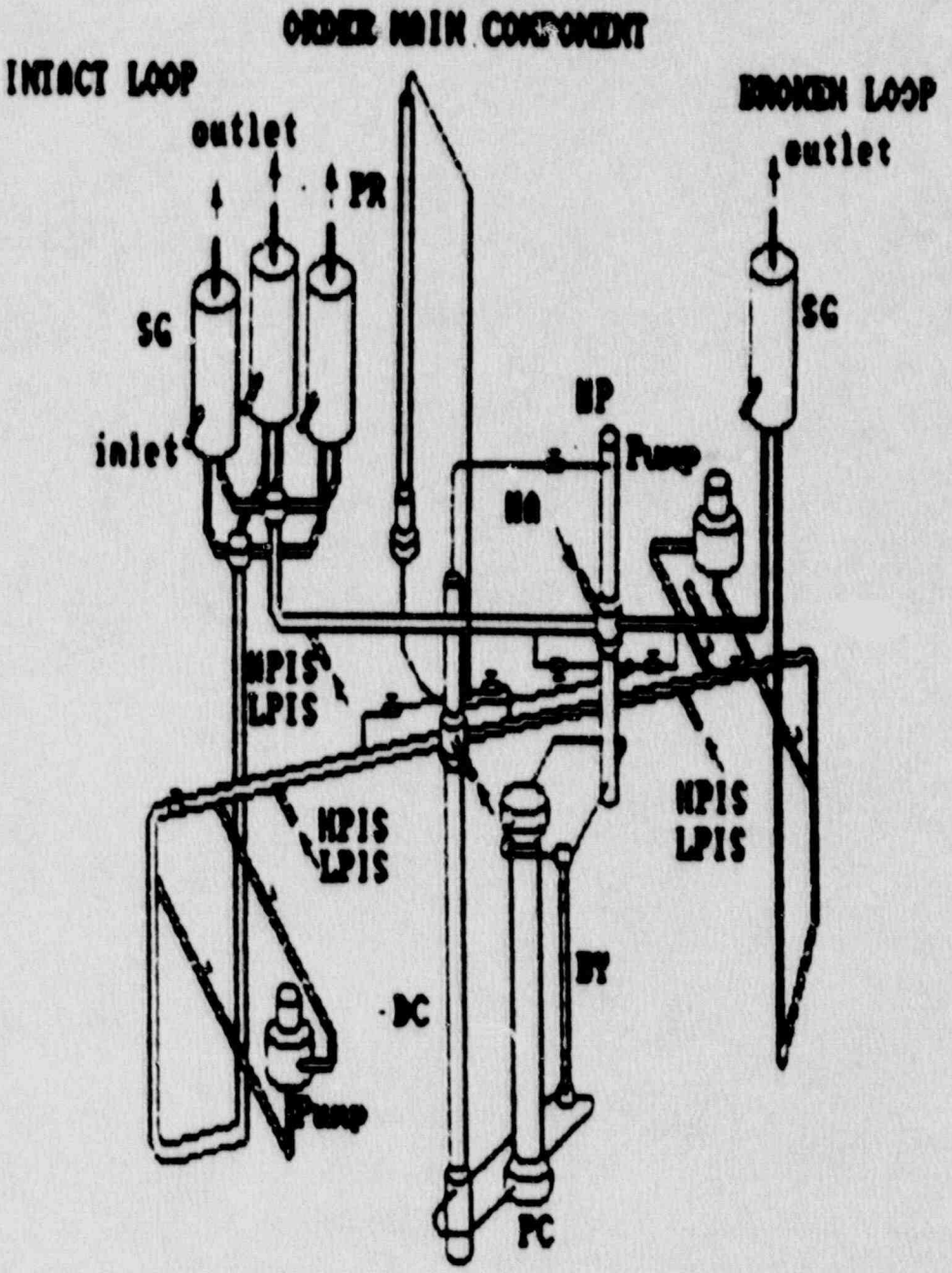
ORDER MAIN COMPONENT
INTACT LOOP
BROKEN LOOP
outlet
outlet
PR
SG
SG
inlet
HP
Pump
HA
HPIS
LPIS
HPIS
LPIS
HPIS
LPIS
PT
DC
Pump
PC

Fig. 1

- On June 30, 1990, U.S.S.R. (Kurchatov) signed agreement joining ICAP. In return for thermal-hydraulic codes, they will provide NRC with assessment results.

- They plan to attend semiannual ICAP meeting October 25-26, 1990.

HIGHLIGHTS

o THERMAL-HYDRAULICS

- DELEGATION VISITED ELECTROGORSK (70 KM EAST OF MOSCOW) TO SEE HEAT TRANSFER LOOP (SIMULATES VVER).
  - o 1:3000 VOLUME SCALED
  - o 1.8 MW MAX ELECTRIC POWER
  - o FULL HEIGHT
  - o SEPARATE DOWNCOMER AND UPPER PLENUM/HEAD

- SIMILAR TO SEMISCALE (1:1700) BUT LESS INSTRUMENTATION AND HEAT LOSS ISSUE QUESTIONABLE.

Severe Accidents

- U.S. discussed current research program in areas of hydrogen and core-concrete interaction. Soviets presented papers on these subjects as well.

- Soviets indicated they have a number of potentially useful testing facilities (core-concrete, lower head testing, hydrogen) but we still have very little detail on them.

- Soviet investment in severe accident research was stated to be about 30M Rubles, or about $5M.

- U.S. PROPOSED (AND U.S.S.R. ACCEPTED) THAT BEST WAY TO COOPERATE IS THROUGH SOVIETS JOINING COOPERATIVE SEVERE ACCIDENT RESEARCH PROGRAM (FORMERLY SFD PARTNERS). AGREEMENT EXPECTED TO BE SIGNED BY MR. TAYLOR NEXT WEEK AT ANNUAL JCCCNRS MEETING IN MOSCOW.

- SOVIET PARTICIPATION WILL BE TO PROVIDE IN-KIND RESEARCH RESULTS.

- WORKING GROUP 6 WILL HOLD A SHORT (1/2 DAY) MEETING ON TUESDAY, OCTOBER 23, 1990. SOVIET DELEGATION WILL THEN VISIT SANDIA (OCTOBER 29, 1990), EPRI (ACE BOARD MEETING), AND UCSB (THEOFANOUS' LAB) NOVEMBER 2, 1990.

- NEXT MEETING TENTATIVELY PLANNED FOR MOSCOW NEXT SUMMER.

PRA

- Soviets appear to have started some work in PRA area.

- Discussions were principally U.S. presentation of 1150 results.

- U.S. offered to review any Soviet PRA that was completed.