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NUCLEAR REGULATORY COMMISSION

ACRST-2087

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Thermal Hydraulic Phenomena Subcommittee

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NUCLEAR REGULATORY COMMISSION

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MEETING

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

THERMAL HYDRAULIC PHENOMENA SUBCOMMITTEE

+ + + + +

WEDNESDAY

DECEMBER 18, 1996

+ + + + +

ROCKVILLE, MARYLAND

+ + + + +

The subcommittee met at the Nuclear Regulatory Commission, Two White Flint North, Room T2B3, 11545 Rockville Pike, at 8:30 a.m., Ivan Catton, Chairman, presiding.

COMMITTEE MEMBERS:

IVAN CATTON	CHAIRMAN
MARIO FONTANA	MEMBER
THOMAS S. KRESS	MEMBER
ROBERT L. SEALE	MEMBER

ACRS STAFF PRESENT:

Paul Boehnert

ACRS CONSULTANTS PRESENT:

Virgil Schrock

V.J. Dhir

Novak Zuber

ALSO PRESENT:

George Bankoff

Alan Levin

Larry Hochreiter

Gene Piplica

Marino diMarzo

Bill Brown

Mike Loftus

A-G-E-N-D-A

P-R-O-C-E-E-D-I-N-G-S

(8:36 a.m.)

CHAIRMAN CATTON: The meeting will now come to order. This is a meeting of the ACRS Subcommittee on Thermal Hydraulic Phenomena. I am Ivan Catton, Chairman of the Subcommittee.

The ACRS Members in attendance are: Mario Fontana, Tom Kress, and Bob Seale. ACRS Consultants in attendance are V.J. Dhir, Virgil Schrock, and Novak Zuber. We also have in attendance Dr. S. George Bankoff who is observing this meeting on behalf of the Office of Nuclear Regulatory Research's Nuclear Safety Research Review Committee.

The purpose of this meeting is to review the Westinghouse Scaling and PIRT Closure Report that addresses the relevant issues associated with the AP600 reactor coolant system. The Subcommittee will gather information, analyze relevant issues and facts, and formulate proposed positions and actions as appropriate, for deliberation by the full Committee.

Most of this meeting will be closed to the public to protect information deemed proprietary to the Westinghouse Electric Corporation.

Paul Boehnert is the Cognizant ACRS Staff Engineer for this meeting. The rules for participation in

today's meeting have been announced as part of the notice of this meeting previously published in the Federal Register on November 27, 1996.

A transcript of the meeting is being kept and will be made available as stated in the Federal Register notice. It is requested that the speakers first identify themselves and speak with sufficient clarity and volume so that they can be readily heard. We have received no written comments or requests for time to make oral statements from members of the public.

This meeting is a follow-on to our meeting of May 9 through 10, 1996. At the conclusion of that meeting, we decided that before we were to meet again, Westinghouse would develop convincing arguments for completeness and that the staff would have reviewed them so that we could all agree. This was to be accomplished via a combination of PIRT, scaling, and common sense. Further, we are to limit this to the primary system, leaving containment issues to another time.

Westinghouse would like the ACRS to reach closure on the acceptability of the PIRT/Scaling Report, WCAP-14727, and on the acceptability of the associated test program described in WCAP-14772.

Before we start, I have a few comments and questions that I hope we can get closed before the meeting

is over. First, I would like some assurance that the large break LOCA is treated the same way that the three and four loop plants were and that the documentation referred to in WCAP-14727 has been cleaned up for promises made at that time.

In the small break LOCA section, it is stated that the NOTRUMP code is an approved code. From what rumors I have heard, there have been a number of major changes during the past few years that are not reflected in the documentation available to us. These changes leave us with a code of unknown pedigree.

During a small break LOCA, the possibility of two-phased counter current flow exists with the liquid phase being sub-cooled. University of Maryland tests show that this can lead to rather strange behavior and maybe Westinghouse could comment at some point. I saw Professor diMarzo here. Maybe he could also comment.

Under transients, steam generator secondary site heat transfer shows high on PIRT charts. I would like a brief explanation of what calculating it entails.

Horizontal pipe stratified flow is also important to long-term cooling, and may well help explain some of the behavior seen at OSU.

SPES-2 is said to be used to validate LOFTRAN-AP LOFTTR2 and NOTRUMP, for transients, steam generator,

tube rupture and small break LOCA. Given the problems with SPES-2 that are outlined in the document, what are the arguments for doing this?

A large number of comparisons are made of OSU and SPES results with a NOTRUMP AP600. In some cases, there are significant differences. The question is, has NOTRUMP been used to predict OSU and SPES and have comparisons with data been made? It seems to me that there are several parts to this question that will have to be addressed at some point.

It is difficult to argue that you can extrapolate to a full scale AP600 if there is integral system behavior you can not simulate or that you can not explain.

Before we start, I would like to give my colleagues a chance to add to what I have said or maybe tell me if I'm out of line or off or whatever. We'll start with Virgil, seeing as how he is furthest away.

MR. SCHROCK: I think you have covered it much better than I could have.

CHAIRMAN CATTON: Novak?

MR. ZUBER: I shall withhold my comments for the end of the meeting. I don't want to --

CHAIRMAN CATTON: Prejudice?

MR. ZUBER: No, I don't want to start, I mean

a confrontational approach, except let me say it was a very disappointing document, especially this last one. Let me just stay at this, and we can discuss it.

CHAIRMAN CATTON: Okay. V.J.?

MR. DHIR: Yes. I have a few comments. One is with respect to PRHR. I think we have been discussing it for the last several meetings. I find no scale test facilities have been fabricated under the conditions expected to be encountered prototype.

Also, I think PRHR is a C tube heat exchanger. Separate tests have been done only with three vertical in-line tubes. In a large scale facility such as SPES and OSU, the flow conditions are very different than those would be encountered in a prototype. I think this meeting or tomorrow they should address PRHR here.

The other area which I did not see much discussion in the report is the what insights we'll gain from separate tests and integral tests, and how these insights were reflected into the regional PIRT.

Computer codes results can not be used to alter the importance of various phenomena. It should come from the experiments.

Also, I find in the report most of the analysis, especially where the equations are normalized, is done under the assumption that there's only single loop

that is dominant. In reality, there were many loops interacting. I would like to see some discussion as to why only one loop was chosen and how the interactions were ignored.

CHAIRMAN CATTON: Mario?

MEMBER FONTANA: Pass.

CHAIRMAN CATTON: Bob?

MEMBER SEALE: Well, the only question I have is what is it about the Yankee metabolism that requires it to be 85 degrees in rooms after the first of November.

CHAIRMAN CATTON: It actually is a thermal hydraulic problem. What it is, it's this extreme effort they go to on the east coast to make sure that the average temperature stays the same year round.

Tom, do you have any comments?

MEMBER KRESS: No. You have covered it pretty well.

CHAIRMAN CATTON: George? First, we're going to hear from Alan Levir of NRR.

MR. HOCHREITER: Ivan, before we get started, could we get a copy of your written comments?

MEMBER KRESS: You went a little fast. I missed a few.

CHAIRMAN CATTON: Yes. It would probably a good idea to give them to you right now. Then you could

send part of your team out to get the answers.

MR. HOCHREITER: Well, they may not come back.

MR. LEVIN: My name is Alan Levin. I am currently Acting Section Chief in the Reactor Systems Branch in the Office of Nuclear Reactor Regulation.

I'll take a few minutes this morning to talk about what the staff's objectives were in asking Westinghouse for this report. Westinghouse will then go through in detail the information that they presented in the report. I will wrap it up at the end with our initial review comments.

I thought that it would be useful to go back and talk a little bit about what we have been doing here. This is both for the benefit of the Committee members, Subcommittee members, and the consultants, that may not have been here when this all started in late 1990 or so. Also just to put us all on the same page in terms of how the review has progressed to this point.

We started a detailed review of the AP600 testing program around 1990. Not coincidently, that's about the time that I joined the staff. There had been some preliminary discussions with Westinghouse early in 1990, but we really got down to business on in depth review late in that year.

In mid-1991, we released SECY-91-273 which had

a dual purpose. The purpose of the SECY paper itself was to establish the overall process for the test program review. We told the world, primarily the vendors, how we were going to proceed step by step through evaluation of their testing programs.

As an appendix to SECY 91-273, we also included an initial evaluation of Westinghouse's test program at that stage. The only thing that wasn't covered explicitly in that initial evaluation was large scale high pressure integral test.

It was determined around the same time that the SECY paper was produced that the test program was deficient in that it did not include a high pressure integral test and we worked for about the next several months as Dr. Catton I'm sure recalls, trying to persuade Westinghouse and the ACRS that the staff's view on this was appropriate.

We did come out with a SECY paper, 92-030. Is this microphone working?

CHAIRMAN CATTON: There's something wrong with it.

MR. LEVIN: We released SECY 92-030 in early calendar year 1992, continued to discuss with Westinghouse the options for doing high pressure integral testing. In March in 1992, they agreed to perform tests in SPES-2,

appropriately modified.

Westinghouse began to submit detailed information on their test programs in 1991, continuing through 1994. This included facility designs, their PIRTs, scaling analyses, and the test matrices.

We were in sort of a continuous review mode on these things. We provided a number of comments back to Westinghouse more or less continuously on the adequacy in our view of some of the test facility designs and the test matrices, and the scaling reports as well.

But we did see some designs in the test facilities to reflect changes in the AP600 design and/or to reflect a better simulation of what we expect are the important phenomena to be.

Most of the design certification testing was performed during calendar year 1994. The PRHR program, as you know, was run before we even got into this review mode in the late 1980s. But the automatic depressurization system tests, CMT tests, Oregon State University, reduced scale integral systems tests and SPES-2 were all done in that same calendar year.

Our activities during the time that the tests were actually performed were observation of the tests. We visited all of the test facilities and watched tests in progress, and a review of preliminary results.

The staff issued the AP600 draft safety evaluation report in November 1994, which reflected our findings on materials submitted through about the middle of that year.

The beginning of the last phase of test related information, which were the data reports and the test analysis reports for these four test programs, were provided between --

CHAIRMAN CATTON: Of which?

MR. LEVIN: Yes, I gave a stack to Paul.

This occurred between December 1994, I think the first one that came in was CMT, and September of 1995, which was the last of the OSU test reports.

The review of the CMT and SPES tests were closed out in the supplemental DSER that was issued in April of 1996. The review of the ADS and OSU programs are considered to be complete except for resolution of outstanding RAIs.

Let me elucidate on this just a little bit. The review of the test programs and review of the codes are obviously linked closely together. But the two are being carried out as separate activities. The review of the test programs really is aimed at answering the question, were the test facilities scaled properly, were the tests run well, were they properly QA'd, are the data

valid data, and can they be used to perform the validation of the AP600 computer codes. That's really where the test review per se stops.

The test review does not go into whether the codes are any good. That is Westinghouse's job, to prove once we had determined that the data are okay.

So when I say that the review of the SPES-2 and CMT test programs are closed, it means that we came to the conclusion, and these were closed pending review of the PIRT scaling and closure report, if any new issues were raised.

But when we say it was closed, it means we determined that to our satisfaction, those questions about the test program had been satisfactorily addressed, that we thought that the data were acceptable for code validation, that Westinghouse had resolved open issues with regard to the unexpected phenomena and scaling distortions and that sort of thing. And that at that point, it was appropriate to go on and start looking at the codes.

So I do want to keep that perspective here as we talk about the test review, because we really are not talking about the code review in any kind of detail at all here.

The passive RHR review is still continuing.

We received a revision of the final test report about a month or so ago. This was done to correct an error in the original data conversion program going from electronic data to engineering units, which had an impact on the results of the test program. We're in the middle of that right now.

The staff requested that Westinghouse provide this closure document about a year ago. We received it in September of 1996.

I also want to mention that the NRC has conducted an extensive confirmatory program in parallel with Westinghouse's efforts. Beginning around 1990, we started doing analyses with RELAP as with some initial modifications to account for the new design aspects of the AP600. The code obviously had not been validated for the AP600 at that point. However, we did get some very interesting insights I think, out of those initial analyses in terms of system based phenomena, system based behavior, which helped to inform our subsequent review of the test programs.

There was also a parallel PIRT development effort, which I think has been very well done and very successful. It has also provided a good basis on which to evaluate Westinghouse's PIRTs. Testing in the ROSA and OSU facilities beginning about 1993 and continuing up to

now. There are still tests planned at OSU and tests planned at ROSA, primarily in the beyond design basis areas.

There's also a parallel scaling evaluation activity that has been performed. The results, preliminary results have just come out on that as well. We are taking a look at those.

So what are our objectives, staff objectives for this report? Well, Westinghouse has developed a series of PIRTs for AP600 accidents and transients, and has done detailed scaling analyses for the CMT, OSU and SPES facilities.

The analysis of the test results are documented in a test analysis report. So there's a whole shelf-full of reports sitting out there with a great deal of information in them. One of the major objectives here was to get significant results from these related activities into one report to address the relationship between them with a focus on the big picture.

The specific objectives, I have identified four of them here. A review of facilities scaling on a consistent basis. The scaling analyses were done at different times by different people. They were not all done initially using the same sort of methodology. So here is an opportunity to go back to a more or less

uniform methodology and do a last take, a last evaluation on that consistent basis to see whether scaling was done properly and to address issues that had been raised over the years by the staff and by the ACRS, things like momentum equation scaling and the top-down integral approach that Wolfgang Wulff had developed.

Another one is possible re-ranking of phenomenon validation of the PIRTs. By validation of the PIRTs, what I mean is demonstration that the test results are consistent with the expert elicitation rankings that are contained in the PIRT.

The Office of Research has done a similar activity. They call this rePIRTing. I think that's probably as good a terminology as anything.

MEMBER KRESS: Alan, what would you do if such an exercise markedly changed your idea of the ranking of phenomena?

MR. LEVIN: I think that has to be reflected in the way that you consider the representation of phenomena in the computer codes. One of the things that we look at that I think is useful is that the PIRT really provides a linkage between the computer codes and the test programs. That high ranked phenomena, important phenomena in the PIRT should be represented in the codes to the best of their ability to do so, and that the model should have

a relatively small degree of uncertainty.

Again, this is ideal situation. Recognize that. It may not be possible to do that point by point down the line, but those are the areas of focus.

If things came up really really different, I mean just totally turned our expectations --

MEMBER KRESS: You would have to go back and re-think your PIRT.

MR. LEVIN: Yes. You would have to go back and rethink your PIRT. You would have to go back and rethink your test program to make sure that you covered off everything appropriately. You know, one of the things here is to look at insights and see whether you have covered off all of the phenomena that you think are going to be present at the AP600. If the test program were to show that there are major phenomena having a significant impact on system response that you hadn't thought were there or important to begin with, then clearly you have to go back and look at your test program and see whether you have covered everything.

CHAIRMAN CATTON: And a good example of that is the thermal stratification. The first PIRT did not mention it.

MR. LEVIN: That's right. But I think you have to look at that sort of an issue, when we know the

codes, a code like NOTRUMP, for instance is not going to be able to represent single phase stratification. So you have to go and look and see whether that looks like it's important in terms of a system response, and if it is, do you understand at least on a qualitative basis, how it might influence it if you can't model it very well.

So there's a number of different aspects that flow into this. It's not all quantitative evaluation using the codes. You have to make some engineering judgements as well.

The last two objectives are the identification, discussion of unexpected phenomena, unexpected loop behavior, their physical mechanisms, and the applicability to the AP600 plant. This is what you just mentioned.

This is important. We clearly in some of the test programs saw unexpected phenomena. In some cases, we have come to the conclusion, we and Westinghouse both have come to the conclusion, that those phenomena or system responses were a distortion related to the facility design, and probably wouldn't be expected in the AP600.

In some cases, the opposite is true. That the mechanism seemed to be based on the same characteristics between the test facility and the plant, and that we might very well expect to see similar phenomena in the plant.

The last objective is the identification and discussion of scaling related distortions, effects on test loop response, relation to AP600 analysis. This includes consideration of phenomena not represented in the tests and/or not modeled in the codes. Thermal stratification is in fact one of those.

So these are some of the key points that we are looking at in terms of the review of the scaling and PIRT closure report.

CHAIRMAN CATTON: You know, this seems to me, the thermal stratification and the CMT, this would be a good case for use of the separate effects tests. Are they doing that, do you know?

MR. LEVIN: I'll let Westinghouse --

MR. HOCHREITER: Yes. We have analyzed the CMT separate effects test with NOTRUMP.

CHAIRMAN CATTON: Okay.

MR. HOCHREITER: We submitted a preliminary validation report on that. In fact, two preliminary validation reports on those. We have completed the analysis for the final validation report which was issued yesterday.

MR. ZUBER: We just heard that NOTRUMP can not calculate that phenomena, so how can you validate it?

MR. LEVIN: No. Let me clarify that. I don't

want to be misunderstood. What NOTRUMP can't represent is thermal stratification in pipes like in the hot leg and the cold leg. I was not referring to CMT.

CHAIRMAN CATTON: And it can't really do it in the CMT either. My understanding of what they have said, they can do things to accommodate the phenomena. Anyway, hopefully we're going to hear a little bit about that.

MR. LEVIN: Well --

CHAIRMAN CATTON: You don't really calculate the stratification other than what is -- just you have a chunk of hot fluid sliding down the top of the CMT. You don't actually calculate the boundary layers and the mixing and the development of the thermal stratification.

MR. HOCHREITER: Unfortunately we calculate too much mixing.

CHAIRMAN CATTON: I understand that. That's typically the problem with these kind of codes because they don't deal with it appropriately.

On the other hand, you have separate effects test data, so that should enable you to put together a transfer function that you can use in the code.

MR. HOCHREITER: I have got some stuff on that that I can show you.

MR. LEVIN: But again, I want to go back to what I said earlier.

CHAIRMAN CATTON: I didn't mean to get into that discussion.

MR. LEVIN: I know. I know. But this is an important point to look at I think down the line. The test program, the CMT test program, clearly did represent the sorts of thermal stratification that you might expect to see in the plant. You can argue some of the finer points like the multi-dimensionality and so forth because of the size of the thing relative to the full-scale CMT, but at least on a one-dimensional basis, the stratification was represented in the test facility. I think that is where we want to focus the discussion here.

Once we can close out the review of the test program as such, then you can go on and look at the details of the code evaluation.

Now we're not finished with NOTRUMP. The reviewer is sitting in the back here. These kinds of issues are going to be taken up as part of the resolution of the code reviews.

CHAIRMAN CATTON: The only reason I mentioned it now is because this is a good example of how the separate effects testing should be used, to address this kind of an issue.

MR. LEVIN: I agree.

CHAIRMAN CATTON: Although I will comment now

that in the PIRT scaling document, they treated it as a one-dimensional problem, so the aspect ratio did not surface anywhere. As a matter of fact, I didn't find any mention of it. Maybe we'll comment on this later, get to the CMT.

When you suspect multi-dimensional behavior, you really should look at multi-dimensional behavior. You won't find it if you look at one-dimensional behavior.

MR. LEVIN: That's correct, but I think you have to evaluate the relative magnitude of the influence of the multi-dimensional aspects.

CHAIRMAN CATTON: Absolutely. But you can't do that looking at one-dimensional equations.

MR. LEVIN: That's true enough.

CHAIRMAN CATTON: That is what they have done. At least that is what they have reported.

MR. ZUBER: I have a question. You didn't finish the review of this report.

MR. LEVIN: We have not finished the review. That's correct.

MR. ZUBER: Okay now, can you comment on these objectives, did they meet them, and to what degree did they meet them.

Let me say why, because that letter which was written December 10 by Zibroski --

MR. LEVIN: Well, I wrote it, but he sent it. I wrote it.

MR. ZUBER: Okay. Wait, wait, wait. The thing is, I was just going to say it's a very good letter.

MR. LEVIN: Thank you.

MR. ZUBER: Many comments which I completely agree. Actually, what really I didn't want to make this comment in the beginning. What is really saddening to me and disturbing is that some of these aggressions were brought over years, at least since 1991. Really you bring them again here. They are really not addressed in this report.

I think those are very good questions you have here. I would really like to hear Westinghouse since they had this letter at least for nine days or whatever, to address them.

For example, the scaling isn't consistent but you have really done over by several people over several years, and you have a mumbo jumbo. You put it together. It's inconsistent. I think this was brought in this letter too.

There are other comments which you didn't bring it here. There is no comparison with experimental data, on the dimensional form. This is something which we are learning through fluid dynamics. Here we pretend to

scale and we don't demonstrate scaling by the most rudimentary elementary way how to do it.

Let me just summarize. It was a good, good questions. I would hope that some of these are addressed in the presentation by Westinghouse.

MR. LEVIN: Well since I haven't heard Westinghouse's presentation, I am going to hope so too.

Let me, if I can, defer my answer to your question until tomorrow when I make my wrap up presentation because I don't want to jump ahead with conclusions in advance of what Westinghouse is going to present here. The closing presentation tomorrow afternoon really does to some extent address our views of where we are relative to these kinds of questions.

MR. ZUBER: Mr. Chairman, this is exactly what I will do tomorrow. I didn't want to address them in the beginning, I have got tomorrow afternoon. But let me say, this was --

CHAIRMAN CATTON: It will give you some time to change them depending on what Westinghouse says.

MR. ZUBER: That's right. I mean to see how they think. But those were very good comments.

MR. LEVIN: Thank you. I can't take complete credit. I had a lot of help from some very good contractors.

CHAIRMAN CATTON: It's not often he says good things. I think just move on.

MR. LEVIN: Well I like to give credit where credit is due.

MR. ZUBER: Same here.

CHAIRMAN CATTON: You don't have to bow.

MR. LEVIN: No. I'm sure, take the good with the bad.

That concludes my initial comments unless there are any further questions.

CHAIRMAN CATTON: No, and I look forward to hearing what you have to say tomorrow.

MR. BOEHNERT: We have to go into closed session now.

CHAIRMAN CATTON: We now have to go into closed session. I assume Westinghouse will take care of kicking those out who should go out.

(Whereupon, at 9:12 a.m. the open session was concluded.)

C E R T I F I C A T E

This is to certify that the attached proceedings before the United States Nuclear Regulatory Commission in the matter of:

Name of Proceeding: ACRS SUBCOMMITTEE ON THERMAL HYDRAULIC PHENOMENA

Docket Number: N/A

Place of Proceeding: ROCKVILLE, MARYLAND

were held as herein appears, and that this is the original transcript thereof for the file of the United States Nuclear Regulatory Commission taken by me and, thereafter reduced to typewriting by me or under the direction of the court reporting company, and that the transcript is a true and accurate record of the foregoing proceedings.

Corbett Riner

CORBETT RINER
Official Reporter
Neal R. Gross and Co., Inc.

INTRODUCTORY STATEMENT BY THE CHAIRMAN OF THE
THERMAL HYDRAULIC PHENOMENA SUBCOMMITTEE
11545 ROCKVILLE PIKE, ROOM T-2B3
ROCKVILLE, MARYLAND
DECEMBER 18-19, 1996

The meeting will now come to order. This is a meeting of the ACRS Subcommittee on Thermal Hydraulic Phenomena.

I am Ivan Catton, Chairman of the Subcommittee.

The ACRS Members in attendance are:

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We have received no written comments or requests for time to make oral statements from members of the public.

(Chairman's Comments-if any)

We will proceed with the meeting and I call upon Dr. Alan Levin of NRC's Office of Nuclear Reactor Regulation to begin.

NRR STAFF PRESENTATION TO THE ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

SUBJECT: STAFF OBJECTIVES FOR AP600 SCALING AND PIRT CLOSURE REPORT

DATE: DECEMBER 18, 1996

PRESENTER: ALAN E. LEVIN

PRESENTER'S TITLE: ACTING SECTION CHIEF
SPECIAL PROJECTS ADVANCED REACTOR SYSTEMS SECTION
REACTOR SYSTEMS BRANCH
DIVISION OF SYSTEMS SAFETY AND ANALYSIS
OFFICE OF NUCLEAR REACTOR REGULATION

PRESENTER'S TEL. NO.: (301) 415-2890

BACKGROUND AND HISTORICAL PERSPECTIVE

STAFF'S REVIEW OF AP600 TESTING PROGRAM BEGAN IN 1990

SECY-91-273 ESTABLISHED PROCESS FOR TEST PROGRAM REVIEWS AND CONTAINED INITIAL EVALUATION OF AP600 TEST PROGRAM

STAFF "WHITE PAPER" ON HIGH-PRESSURE INTEGRAL TESTING PREPARED IN MAY 1991; LAID GROUNDWORK FOR SECY-92-030 ON NEED FOR TESTING

WESTINGHOUSE AGREED (MARCH 1992) TO PEFORM TESTS IN SPES-2 FACILITY

MATERIAL ON TEST FACILITIES' DESIGNS, PIRTS, SCALING, AND TEST PROGRAMS PROVIDED TO STAFF FROM 1991 TO 1994

STAFF PROVIDED COMMENTS TO WESTINGHOUSE RESULTING IN CHANGES IN DESIGNS AND TEST MATRICES

MOST DESIGN CERTIFICATION TESTING WAS PERFORMED DURING CY 1994 (ADS, CMT, OSU, SPES-2)

STAFF ACTIVITIES: OBSERVATION OF SELECTED TESTS AND REVIEW OF PRELIMINARY RESULTS

AP600 DSER ISSUED IN NOVEMBER 1994, REFLECTING STAFF FINDINGS THROUGH MID-1994

BACKGROUND AND HISTORICAL PERSPECTIVE (cont'd)

FINAL DATA REPORTS AND TEST ANALYSIS REPORTS PROVIDED BETWEEN DECEMBER 1994 AND SEPTEMBER 1995

- REVIEW OF CMT AND SPES-2 TESTS CLOSED OUT IN SUPPLEMENTAL DSER (APRIL 1996); REVIEW OF ADS AND OSU PROGRAMS COMPLETE EXCEPT FOR RESOLUTION OF OUTSTANDING RAIs

- PRHR REVIEW ONGOING DUE TO REVISION OF FINAL TEST REPORT TO CORRECT ERROR IN ORIGINAL DATA CONVERSION

STAFF REQUESTED THAT WESTINGHOUSE PROVIDE "CLOSURE" DOCUMENT ABOUT ONE YEAR AGO

- SCALING AND PIRT CLOSURE REPORT SUBMITTED FOR STAFF REVIEW IN SEPTEMBER 1996

NRC HAS CONDUCTED EXTENSIVE CONFIRMATORY PROGRAM IN PARALLEL WITH WESTINGHOUSE'S EFFORTS

- ACTVITIES INCLUDE ANALYSES (BEGINNING CA. 1990); PIRT DEVELOPMENT (ALSO CA. 1990); TESTING IN ROSA/LSTF AND OSU FACILITIES (1993 - PRESENT); AND SCALING ANALYSES OF INTEGRAL FACILITIES

NRC OBJECTIVES FOR SCALING AND PIRT CLOSURE REPORT

WESTINGHOUSE HAS DEVELOPED PIRTs FOR AP600 ACCIDENTS AND TRANSIENTS

DETAILED SCALING ANALYSES DEVELOPED FOR CMT, OSU, AND SPES-2 FACILITIES

ANALYSIS OF TEST RESULTS DOCUMENTED IN DATA AND TEST ANALYSIS REPORTS

STAFF REQUESTED A SINGLE "CLOSURE" DOCUMENT TO PULL TOGETHER SIGNIFICANT PIRT/SCALING/TESTING RESULTS IN A UNIFIED FORM, WITH FOCUS ON "BIG PICTURE"

SPECIFIC OBJECTIVES:

- REVIEW OF FACILITY SCALING ON A CONSISTENT BASIS, ADDRESSING ISSUES RAISED BY STAFF AND ACRS (e.g., MOMENTUM EQUATION, TOP-DOWN APPROACH)
- POSSIBLE RERANKING OF PHENOMENA AND "VALIDATION" OF PIRTs, i.e., DEMONSTRATION THAT THE TEST RESULTS ARE CONSISTENT WITH IDENTIFIED PHENOMENA AND EVALUATION OF THEIR IMPORTANCE
- IDENTIFICATION AND DISCUSSION OF UNEXPECTED PHENOMENA/LOOP BEHAVIOR--PHYSICAL MECHANISMS AND APPLICABILITY TO AP600 PLANT
- IDENTIFICATION AND DISCUSSION OF SCALING-RELATED DISTORTIONS, EFFECTS ON TEST LOOP RESPONSE, RELATION TO AP600 ANALYSIS; INCLUDES CONSIDERATION OF PHENOMENA NOT REPRESENTED IN TESTS AND/OR NOT MODELED IN ANALYTICAL CODES (e.g., THERMAL STRATIFICATION)