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NUCLEAR REGULATORY COMMISSION

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**NUCLEAR REGULATORY COMMISSION**

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**BRIEFING BY WESTINGHOUSE ON AP600**  
**DESIGN CERTIFICATION**

- - - -

**PUBLIC MEETING**

Nuclear Regulatory Commission  
One White Flint North  
Rockville, Maryland

Thursday, April 7, 1994

The Commission met in open session,  
pursuant to notice, at 10:00 a.m., Ivan Selin,  
Chairman, presiding.

**COMMISSIONERS PRESENT:**

IVAN SELIN, Chairman of the Commission  
KENNETH C. ROGERS, Commissioner  
FORREST J. REMICK, Commissioner

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## STAFF AND PRESENTERS SEATED AT THE COMMISSION TABLE:

JOHN HOYLE, Assistant Secretary

MARTIN MALSCH, Office of the General Counsel

HOWARD J. BRUSCHI, General Manager, Advanced  
Technology, Westinghouse

DR. LARRY HOCHREITER, Consulting Engineering, Nuclear  
Technology Division, Westinghouse

ROBERT M. VIJUK, Project Manager, AP600 Design  
Certification, Westinghouse

BRIAN A. McINTYRE, Manager, Advanced Plant Safety and  
Licensing, Westinghouse

RON P. VIJUK, Manager, Systems Engineering,  
Westinghouse

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

10:00 a.m.

CHAIRMAN SELIN: Good morning, ladies and gentlemen.

The Commission is pleased to welcome representatives from Westinghouse to brief us on the status of the AP600 design certification program. Our last briefing was two years ago, at which time Westinghouse described some enhancements that they were making in the testing program. So, I expect that the testing will be a major part of the discussion this morning.

The AP600 is the first advanced passive design submitted for design certification. It has occasioned quite a bit of interest around the world. Almost every place I go people ask me about the system. So, it poses both unique challenges and unique advantages. So, we're looking very much forward to hearing what you have to say both about the system substantively in the test program and from a programmatic point of view just how things are proceeding.

Commissioners?

COMMISSIONER REMICK: Just one comment. Scanning through the viewgraphs, I see you're going to

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1 be talking about a lot of tests. If you could  
2 identify where those tests were conducted, I think it  
3 would be very helpful.

4 MR. BRUSCHI: We will.

5 CHAIRMAN SELIN: Mr. Bruschi?

6 MR. BRUSCHI: Yes. Good morning. I'm  
7 Howard Bruschi. I am General Manager of Advanced  
8 Technology for the Energy Systems Business Unit of  
9 Westinghouse. Today I have with me, to my far left,  
10 Brian McIntyre, Manager of Advanced Plant Safety and  
11 Licensing. To my immediate left, Bob Vijuk who is the  
12 Project Manager of the AP600 design certification  
13 program. To my right, Doctor Larry Hochreiter,  
14 Consulting Engineer for the Nuclear Technology  
15 Division of Westinghouse, and to his right, Ron Vijuk,  
16 Manager of Systems Engineering who is here to answer  
17 any detailed technical questions that may arise.

18 (Slide) May I have the first slide,  
19 please, or the second slide?

20 Since we last met, we've made significant  
21 progress towards design certification of the AP600.  
22 As you mentioned, Commissioner Selin, the purpose of  
23 today's meeting is to provide you with a status of  
24 that design certification program and, in particular,  
25 to provide you where we are and what are some of the

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1 issues that are being discussed with the staff?

2 We submitted a safety analysis report in  
3 June of 1992. It was the most complete application  
4 submitted under Part 52. It contained over 12,000  
5 pages of text, figures and analysis.

6 In December 1992, we followed up with the  
7 ITAAC submittal which incorporated industry lessons  
8 learned which made the application complete at that  
9 time.

10 The NRC review, of course, is well  
11 underway. I can say that I am very pleased to see the  
12 detailed interactions taking place between  
13 Westinghouse and the NRC staff and the membership of  
14 the NRC. It has progressed to the point that the  
15 staff is conducting audits of our work and visited the  
16 test facilities to witness testing. Response from the  
17 staff that have witnessed tests has been quite  
18 positive. We've received many RAIs from the branches.  
19 We, Westinghouse, need to receive the remaining RAIs  
20 now, at this time, in order to preserve the schedule  
21 that we've discussed with the NRC for both DSER  
22 application or submittal as well as the FDA. Through  
23 these RAIs, it's become evident that there are no show  
24 stopping technical issues which I think is  
25 significant.

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1                   Focus, of course, has been on testing. It  
2 is a key part of design certification and, as you've  
3 noted, we met two years ago to indicate the agreement  
4 that we had with the NRC on the testing program. We  
5 need assurance. We need assurance now that the  
6 testing matrix as we are executing it will provide the  
7 information necessary to verify and validate our  
8 computer codes.

9                   The testing program closure with the staff  
10 I feel is near at hand. We have a meeting scheduled  
11 following this meeting to ensure agreement on the  
12 testing matrix. Doctor Hochreiter will discuss more  
13 details on the status of the major testing programs  
14 following my introduction.

15                   Another subject is the AP600 regulatory  
16 treatment of non-safety systems. We've got a high  
17 level agreement between the NRC and industry which we  
18 think was a significant step forward in the AP600  
19 review. It provided guidance for both Westinghouse  
20 for implementation and for the staff to use for their  
21 review. Now the challenge is to work out the details  
22 of the regulatory treatment of the non-safety systems.  
23 Brian McIntyre will discuss some of those details in  
24 his presentation.

25                   (Slide) May I have slide 3, please?

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1 Westinghouse is quite committed to the  
2 AP600. We believe strongly in the future of  
3 standardized plants the size of the AP600. An NPOC  
4 survey that was performed in late 1992 indicated that  
5 of those utilities that were considering nuclear  
6 energy as part of their portfolio for energy additions  
7 to the baseload capacity in the next decade, 74  
8 percent of them preferred the mid-sized passive plant.  
9 Twenty-two percent had no preference between the mid-  
10 size passive plant or the larger evolutionary plants.

11 The AP600 complies with the Advanced Light  
12 Water Reactor Utility Requirements Document. This has  
13 been a key part of the AP600 program for Westinghouse  
14 since it clearly then would represent the desires of  
15 our customer base, the utilities.

16 Last year, we transitioned from a  
17 functional organization to a project organization.  
18 Now, this provided a focus group whose sole mission is  
19 to achieve design certification for the AP600. This  
20 was instituted in part because of the slippage in  
21 schedule we had at the Oregon State University test  
22 facility. We think with this team in place we have  
23 the necessary focus to ensure that schedules are met  
24 here and after.

25 With regard to schedule, we have developed

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1 quite a detailed schedule and have discussed this with  
2 the NRC staff. It contains over 6,000 logic ties in  
3 the schedule. It's been formally submitted to the  
4 staff as requested in their March 7th letter. Bob  
5 Vijuk is going to discuss this schedule in more detail  
6 later in his presentation.

7 Key milestones about which Westinghouse  
8 and NRC have had recent discussions show that our  
9 respective schedules aren't consistent with respect to  
10 issuance of a draft SER in the fourth quarter of 1994  
11 and the issuance of a final design approval in the  
12 June/July 1996 time frame.

13 The AP600, about a year ago, was awarded  
14 a first-of-a-kind engineering contract, which I think  
15 is quite significant. The purpose of first-of-a-kind  
16 engineering is to ensure that enough detail work is  
17 done on the plant to enable a plant designer such as  
18 Westinghouse to quote a firm price, firm schedule  
19 plan. Support for the AP600 was provided by all 16  
20 utilities voting for this contract. Fifty percent of  
21 those utility voted all of their support for the  
22 AP600. This is yet another indication of the strong  
23 support that the AP600 has from the utility community  
24 here in the U.S.

25 With regard to international

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1 participation, this has increased significantly over  
2 the last few years. At the time that the safety  
3 analysis report was submitted, there were  
4 approximately 50 engineers from ten organizations  
5 representing six countries working on the AP600. Now,  
6 during first-of-a-kind engineering, we have increased  
7 this number to over 80 engineers from 18 different  
8 organizations representing ten countries and there are  
9 two more countries that are interested in joining this  
10 program. So, again, this demonstrates support both in  
11 the domestic community as well as the international  
12 community for the AP600.

13 COMMISSIONER ROGERS: Could I ask just for  
14 a second?

15 DOCTOR HOCHREITER: Analysis as well.

16 COMMISSIONER ROGERS: Analysis?

17 MR. BRUSCHI: Yes.

18 COMMISSIONER ROGERS: As integrated into  
19 the team?

20 DOCTOR HOCHREITER: Yes. We team them up  
21 with Westinghouse engineers.

22 MR. BRUSCHI: There's three categories of  
23 participation. First is the category of engineers  
24 that actually reside in Pittsburgh. As Doctor  
25 Hochreiter indicated, they get assigned to our

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1 management teams that become integrated within the  
2 management teams at the Westinghouse headquarters in  
3 Pittsburgh. There are engineers that are assigned to  
4 some of our subcontractors, again being assigned to  
5 the subcontractors with specific work assignments.

6 The second category are engineering groups  
7 that remain in their home countries, engineers that  
8 have worked with us in the past with whom we have a  
9 lot of confidence. So, we assign work packages to  
10 them, integral work packages that they work on. And  
11 the third category is the testing, which you'll hear  
12 more about with regard to international sites for  
13 testing.

14 As a final comment, our last briefing in  
15 March 1992, one of the key items we discussed was the  
16 integral systems test performed at the SPES facility  
17 in Italy, full height, full pressure test. We have  
18 committed to run these tests. Let me say the NRC  
19 senior management has visited that facility and has  
20 indicated positive reaction to what they've seen both  
21 as a facility and with the first test that was  
22 successfully run on February 5th, 1994. The results  
23 from this first test was a small break LOCA test. The  
24 results were as expected, which I think is a good  
25 indication, good first indication of where we are.

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1 Larry Hochreiter is going to give you some  
2 more details now about the test program, so let me  
3 turn the microphone over to him unless you have  
4 questions from me at this time.

5 CHAIRMAN SELIN: Never say that. If there  
6 are questions, you'll get them.

7 DOCTOR HOCHREITER: I'm Larry Hochreiter.

8 (Slide) Could I have the next slide,  
9 please?

10 When we structured our test program for  
11 the AP600, we considered many different elements. For  
12 instance: what systems are different; comparing the  
13 plant, the AP600 plant to current PWRs; what design  
14 information is needed; what phenomena in particular  
15 are important for this type of a design; which codes  
16 and models we should be using to represent the  
17 different passive systems in the AP600 design; and  
18 then what data we need for code and model  
19 verification. So, we purposely structured the tests  
20 from the point of view of validating safety analysis  
21 codes such that we could predict then with confidence  
22 the AP600 system behavior.

23 (Slide) Next slide, please.

24 This led us to generate a program that had  
25 a series of scaled and full-scale tests of critical

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1 components such as the core make-up tank. This test  
2 is being performed at our Waltz Mills site south of  
3 Pittsburgh. The passive residual heat removal test,  
4 this test has already been performed at our Science  
5 and Technology Center in Pittsburgh. The automatic  
6 depressurization systems tests, these tests are being  
7 performed at the Vapore facility in Italy. The  
8 containment water distribution tests, these tests were  
9 performed at our Waltz Mill site just south of  
10 Pittsburgh. And wind tunnel tests for the  
11 containment, these tests were performed first at our  
12 R&D center to get a scoping behavior of the wind  
13 effect around the containment, and then we've run a  
14 series of test at the University of Western Ontario  
15 where they have a larger boundary layer wind tunnel.

16 Now, the objective of these tests are to  
17 provide a basis to develop particular component models  
18 which will go into the safety analysis codes to  
19 represent those particular phenomena that you'd expect  
20 to see for the core make-up tank, the passive residual  
21 heat removal system and so forth. We then also have  
22 the integral tests. The SPES full height, full  
23 pressure test is the test that's being run over in  
24 Italy at Piacenza. This is 97 heater rods, full  
25 height, full modeling of all the systems in the AP600.

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1           The Oregon State University test is out of  
2           Corvallis. This is a reduced height, reduced pressure  
3           facility with the emphasis being to examine the small  
4           break LOCA and the transition into long-term cooling.  
5           So, we simulate the full complement of the AP600  
6           systems, including the RWST and then into sump  
7           injection. So, these transients cover the long-term  
8           cooling behavior, starting with an initial  
9           depressurization.

10           The small-scale containment test has  
11           already been performed at our Westinghouse Science and  
12           Technology Center. This is a three foot diameter, 25  
13           foot high vessel where we put steam on the inside and  
14           we simulate the water flow on the outside so that we  
15           get the integral effects of the condensation in the  
16           water distribution. Then we have a large-scale  
17           containment test also performed at our Science and  
18           Technology Center where now we've tried to maintain a  
19           better aspect ratio of the containment height to  
20           diameter. So, we have a 15 foot diameter vessel  
21           roughly 25 feet high. All these tests now provide a  
22           basis to validate our codes when they're applied in a  
23           system manner. So the component tests will give us  
24           the information to develop models, the integral tests  
25           give us a way of verifying the integral behavior of

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1 the codes when we predict these types of transients.

2 Then the methods that we're using to try  
3 and predict these transients, we're trying to use the  
4 best estimate thermal hydraulic computer codes to do  
5 this primarily to get a more accurate prediction of  
6 the phenomena. Not necessarily to generate margin,  
7 but to understand better exactly what's happening.

8 (Slide) Next slide, please.

9 Well, we've had, as Howard Bruschi  
10 indicated, frequent and detailed interactions with the  
11 NRC staff. We've had specific meetings on every one  
12 of these tests. In fact, several meetings on each  
13 test where we've gone through and looked at the design  
14 of the facility, the instrumentation of the facility,  
15 the test matrix, pre-test and engineering analysis  
16 that we performed on the facility as well as the test  
17 results. We've gotten RAIs which we responded to on  
18 the test program and we have a weekly phone call with  
19 the staff to advise them of the status of each one of  
20 our test facilities and test programs.

21 We've submitted to the NRC numerous  
22 documents that describe the tests, W caps on completed  
23 programs with the data. We've submitted day of test  
24 reports and quick look reports on some of the data, as  
25 well as research reports where we've had contractors

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1 do work for us, and the staff has visited all the  
2 facilities where we're running these tests.

3 (Slide) Next slide, please.

4 The interactions with the staff have been  
5 positive. We've gotten a lot of very good suggestions  
6 from the staff and their consultants and we've tried  
7 to integrate that into the test program. We have had  
8 actually the luxury of having a preoperational period  
9 where we shake down the test facility and so we look  
10 very carefully at the design, the instrumentation and  
11 so forth and we've gone back in many of the tests and  
12 have upgraded the instrumentation because of things  
13 that we've found out in these preoperational tests.  
14 At that time when we upgrade the instrumentation, we  
15 bring into the facility design any comments that we've  
16 gotten back from the NRC, particularly with regard to  
17 instrumentation. That's helped and it has made the  
18 test better.

19 We have had issues with the staff on the  
20 tests, primarily on the test matrices. There is a  
21 letter issued in November which listed what the staff  
22 considered as open items on the test program. We've  
23 been meeting on a very regular basis with the staff,  
24 trying to get closure on these items and we'll have a  
25 meeting this afternoon, hopefully to get closure.

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1 We're very close, I think, to closure. They've looked  
2 at the program very well. I think there are just a  
3 few residual open items that we have to discuss with  
4 the staff.

5 (Slide) Next slide, please.

6 Now, we've also had the ACRS involved in  
7 the program, basically from the onset of the test  
8 program and the AP600 program. We've again had very  
9 specific meetings on a given test with the ACRS. This  
10 has been primarily the Thermal Hydraulic Subcommittee,  
11 Doctor Catton's committee. In fact, recently what  
12 we've been doing is we've been having back to back  
13 meetings, first with the staff one day, then with the  
14 ACRS the second day. We did that at Oregon State. We  
15 just did it last month on the core makeup tank test.  
16 We've had the staff and their consultants visit the  
17 facilities. We've already had a meeting out at Oregon  
18 State, so everybody got to see the facility out there.  
19 Doctor Catton has been at SPES. They visited the CMT  
20 and the containment tests last month. We made  
21 presentations both to the Thermal Hydraulic  
22 Subcommittee and the Advanced Plant Subcommittee and  
23 to the full Committee.

24 (Slide) Next slide, please.

25 Now, we do have a point of difference with

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1 the ACRS, and it's been primarily on scaling. The  
2 discussion is not whether you should do scaling or  
3 not, but the degree in level and effort involved.  
4 What the subcommittee and the consultants would like  
5 would be a very detailed scaling analysis for the  
6 majority of the facilities which is consistent with  
7 the severe accident SASA methodology which was used  
8 for severe accident scaling. Now, we have applied  
9 that selectively on our facilities where we thought  
10 the issues, scaling issues were paramount. In  
11 particular, on the Oregon State facility, because this  
12 is a reduced height, reduced pressure facility, where  
13 we're looking at trying to model the entire range of  
14 phenomena that you'd expect to see in the AP600, we  
15 produced a three inch thick scaling report on that  
16 facility and used the scaling results directly in the  
17 design of the facility. We had three reviews with the  
18 ACRS and the NRC on that and they more or less concur  
19 with the effort. We got very good compliments from  
20 them for that effort.

21 On the SPES facility, the design of the  
22 facility and the scaling and basis for the facility is  
23 it's simpler because it's full height, full pressure  
24 and it's power to volume scaling. We have submitted  
25 a scaling report on that and I don't think there's any

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1 issues with that right now. We have identified the  
2 atypicalities in the facility and shown how we've  
3 addressed those.

4 For the core makeup tank, we had  
5 originally done geometric scaling on the core makeup  
6 tank. At the request of the staff, we did produce a  
7 scaling report on the core makeup tank which is  
8 similar to the level of effort that we -- well, not  
9 the level of effort, but the detail that we did on the  
10 Oregon State test facility. We just had a review last  
11 month with both the staff and the ACRS and the ACRS  
12 would like us to have more detail in that report.

13 On the containment tests, we took a  
14 different tact. There we used geometric arguments to  
15 establish the facility, the design of the facility,  
16 and then concentrated primarily on the models that you  
17 would use to represent the heat transfer and fluid  
18 mechanics inside the containment where test versus  
19 facility. In the terminology of the PISM report or  
20 PASM report that the NRC generated, this is a bottom-  
21 up scaling approach. What the ACRS would like to see  
22 would be more of a top-down scaling approach. So,  
23 we're evaluating that right now. But we're using  
24 scaling basically to support the code validation. We  
25 believe that our computer codes can help us examine

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1 these facilities and give us information that can help  
2 scale the facilities.

3 (Slide) Next slide, please.

4 Again the ACRS interactions have  
5 contributed to development of our test program. The  
6 meetings that we've had with the members and the  
7 consultants have given us good information, insight,  
8 things to look for, tips on better ways of  
9 instrumenting things, tips on ways of running some  
10 quick and dirty shakedown tests to verify some of our  
11 measurement systems and again things to look for. For  
12 instance, Doctor Catton had alerted us to the  
13 possibility of rapid condensation at the top of the  
14 CMT from his own experiences in the aerospace  
15 industry. We were aware of that and it was confirmed  
16 in the experiments that we did run.

17 So, the suggestions that we've gotten from  
18 the ACRS and their consultants, we have again tried to  
19 factor those back into the program to make it a better  
20 program.

21 (Slide) Next slide, please.

22 Now, we have been running experiments  
23 since 1988 and we have been able to integrate some of  
24 the early test results into the SSAR analysis. We had  
25 completed the small scale containment systems tests.

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1 This is the three foot diameter vessel, 25 feet high,  
2 and we had completed some of the initial baseline  
3 large scale containment systems tests. Those were  
4 documented in the SSAR and we used those to support  
5 the W Gothic containment analysis computer code.

6 We had completed the residual heat removal  
7 systems tests. From those tests we developed heat  
8 transfer correlation for the outside of the PRHR heat  
9 exchanger and that went into our LOFTRAN system  
10 analysis code and into the SSAR. We had also  
11 completed the high-inertia rotor pump bearing test.  
12 That gave us the coast-down time for the RCPs for the  
13 AP600 which we again then factor into our transient  
14 analysis.

15 Using these test results --

16 COMMISSIONER REMICK: Excuse me. Are all  
17 those done in Pittsburgh, those four?

18 DOCTOR HOCHREITER: Yes, all four were  
19 done in Pittsburgh.

20 The results of those, along with our  
21 analysis again, confirm that we had plenty of margin  
22 in the AP600 design.

23 (Slide) Next slide, please.

24 Now, what I was going to do was to go  
25 through and give a status on each of the major tests

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1 that we're examining for design certification. The  
2 first one is the SPES facility and again it's a full  
3 height, full pressure. This test is being run in  
4 Piacenza. The first test we ran was a two-inch cold  
5 leg break test. This is a break from full  
6 temperature, full pressure scaled power conditions.  
7 The test operated -- the facility operated very well.  
8 The tests met our expectations. All the systems  
9 functioned as they should function. The system  
10 depressurized as it should. We got into a stable  
11 IRWST injection. The core, the rod bundle in the core  
12 never came uncovered, so the test was very much a  
13 success.

14 COMMISSIONER REMICK: The data acquisition  
15 system worked?

16 DOCTOR HOCHREITER: Yes, it did. We got  
17 a lot of data, a lot of plots. There's about 600  
18 channels of instrumentation on this facility.

19 COMMISSIONER REMICK: Elaborate system.

20 DOCTOR HOCHREITER: Yes, and the frequency  
21 is very rapid, just like one sample a second.

22 Now, that test was run on February 5th.  
23 Everybody was flushed with success, so they  
24 immediately started planning the next test for the  
25 next weekend. We run these tests on Saturdays and we

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1 started to power up for the next test a week later and  
2 we found that we had leakage in some of the gaskets in  
3 the power channel. So, we had to take the facility  
4 down and we've repaired those gaskets. There are  
5 other repair items that we did at the same time. In  
6 fact, we also put in some rods, additional heater  
7 rods. Not additional heater rods, but rods to more  
8 thermocouples, particularly at the upper elevations to  
9 give us more coverage there. Our next matrix test is  
10 scheduled for this coming Saturday.

11 So, this facility is operating as we had  
12 planned and the results are as we had anticipated.

13 The Oregon State --

14 COMMISSIONER REMICK: What's the reason  
15 for Saturday? Is that because of your electricity  
16 consumption?

17 DOCTOR HOCHREITER: That's right, the cost  
18 of power.

19 COMMISSIONER REMICK: I see.

20 DOCTOR HOCHREITER: It's a significant  
21 difference between during the week and then on a  
22 weekend.

23 (Slide) Next slide, please, 14.

24 The Oregon State test facility, this is  
25 the low pressure reduced height, quarter scale height

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1 integral system test facility out at Corvallis. The  
2 construction of that facility is complete, with the  
3 exception of some of the break valves and piping.  
4 That's being completed as we speak. We have completed  
5 the volume check tests and actually I think this slide  
6 is out of date. We have completed the code  
7 preoperational test where we measure the pressure  
8 drops around the system. We're starting to get ready  
9 to run the hot functional test with a hot shakedown  
10 test this weekend. These tests will put power to the  
11 bundle and will examine force flow conditions, PRHR  
12 heat transfer under force flow and natural circulation  
13 conditions and the PRHR heat transfer under natural  
14 circulation conditions. We'll then begin matrix tests  
15 at the end of June. So, this facility is just about  
16 ready to start our matrix testing.

17 COMMISSIONER REMICK: Are you and the  
18 staff in agreement on the matrix tests yet at OSU?

19 DOCTOR HOCHREITER: The tests that we have  
20 proposed the staff has agreed with, to my knowledge.  
21 What they're looking for are possibly additional types  
22 of tests and that's really one of the open items that  
23 remains. What we've been trying to present to the  
24 staff is that we should be looking at phenomena, not  
25 the particular nature of the test. When we look at

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1 the types of tests that they're interested in for the  
2 particular types of transients, we can show that the  
3 phenomena that you see for those transients is the  
4 same as the phenomena that we see in the tests that  
5 we've already agreed to in the matrix.

6 So, that's the type of discussion we've  
7 been having with the staff.

8 COMMISSIONER REMICK: Will you have that  
9 discussion today?

10 DOCTOR HOCHREITER: Yes, this afternoon.

11 COMMISSIONER REMICK: I understand that  
12 you have a new way of measuring break flow.

13 DOCTOR HOCHREITER: Yes.

14 COMMISSIONER REMICK: How confident are  
15 you that that will work?

16 DOCTOR HOCHREITER: I've used this  
17 technique before on our reflood experiments that we  
18 ran in Pittsburgh for the Committee's purposes. What  
19 we do is we simulate the break basically with an  
20 orifice that's the flow area that we want to model.  
21 But then we expand the mixture, put it into a phase  
22 separator, separate out the liquid and the steam and  
23 then we measure individually the components, the  
24 liquid component and the steam component. Then we  
25 recombine the flows and put them into either the sump,

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1 if it's truly the break. Or if it's the ADS, we do  
2 the same thing with the ADS flows, we recombine it,  
3 put it through the sparger into the IRWST.

4 When I've used these on these experiments,  
5 these other experiments, we get very good mass  
6 balances. So, as long as the flow has expanded out,  
7 which we've designed it to do, you should already be  
8 at near containment pressure. We've sized the  
9 separator for the peak flows that we would expect.  
10 So, I think we'll get good data.

11 COMMISSIONER REMICK: Will you still be  
12 using a gamma densitometer?

13 DOCTOR HOCHREITER: No.

14 COMMISSIONER REMICK: You will not?

15 DOCTOR HOCHREITER: That was the purpose  
16 for using this measurement technique, because the  
17 range of conditions is so large when you start from a  
18 liquid system and then you depressurize it and flash  
19 the mixture, you're basically coming out with steam at  
20 the end. I think we'll have more reliability making  
21 two more accurate single phase measurements than  
22 trying to make a two phase measurement.

23 As I said, the matrix test will begin in  
24 OSU at the end of June.

25 (Slide) Next slide, please.

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1           The ADS systems test, these are again the  
2 tests at the Vapore facility in Italy. Here we're  
3 modeling the ADS piping, the first three stages of the  
4 ADS piping. We have a sparger, full-scale sparger and  
5 this goes into a quench tank. Then we have a large  
6 supply tank, 1300 cubic feet, which basically provides  
7 the mass and energy source which we then depressurized  
8 down through the piping system itself. The  
9 construction on that facility has started. We're  
10 going to begin commissioning tests toward the end of  
11 June and then matrix tests will be completed at the  
12 end of October.

13           (Slide) Next slide, please.

14           The core makeup tank tests, these tests  
15 are underway. The core makeup tank that we're using  
16 in this facility is roughly a two foot diameter tank  
17 ten feet high. In the plant, the tank is 12 feet  
18 diameter and 20 feet high.

19           We've done a very elaborate series of  
20 preoperational tests. When we ran some of the  
21 preoperational tests, what we saw was very rapid  
22 condensation when we had the tank initially full of  
23 water and we brought steam to the top of the tank. We  
24 would get a steam jetting effect, a large degree of  
25 mixing which would delay the injection of the water

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1 out of the core makeup tank because you would have  
2 such rapid condensation at the top of the tank. So,  
3 what we did was design a steam distributor which  
4 distributes the steam, slows the velocity of the steam  
5 down and gives it a radial direction of flow rather  
6 than axial direction of flow. We looked at three  
7 different designs, trying to optimize the performance  
8 of these designs. We've chosen one and then scaled  
9 all the other facilities, SPES, OSU, with the same  
10 type of design. We've given that information to the  
11 NRC and they've then scaled ROSA to include this type  
12 of a sparger in the core makeup tank.

13 When we put that sparger into our tests  
14 and run the same type of test, what we find is a still  
15 rapid condensation, but the time period that that  
16 occurs is much shorter because you build up a hot  
17 layer of water and then the tank drains as you'd  
18 expect.

19 So, we spent a lot of time running those  
20 types of tests. We then went through a period where  
21 we modified the facility, we put in additional  
22 instrumentation, some of which had been suggested by  
23 the staff and by the ACRS and their consultants, and  
24 then we've started rerunning the matrix tests and  
25 we're in the process of running the matrix test right

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1 now.

2 (Slide) Next transparency.

3 The passive containment cooling tests,  
4 basically all the testing is complete. We have  
5 completed the small scale systems test, we've  
6 completed three series now on the large-scale integral  
7 containment test, the 1/8th scale test. The third  
8 series of tests that we ran we ran specifically to  
9 look at addressing RAIs which we had already received  
10 from the staff. So, we felt the best way of  
11 addressing those was by running a particular test that  
12 addressed the issue that the staff had raised. We've  
13 also run two series of water distribution tests and  
14 we've run two series of wind tunnel tests. So, the  
15 testing for the containment is basically completed.

16 As part of the program, we did run a blind  
17 test and we have locked that data up. We are in the  
18 process of completing the documentation of the data.  
19 The Westinghouse analysis people do not see that data.  
20 We will be doing a blind prediction for that test,  
21 then the data will be released to the analysis people.  
22 We have been releasing to the staff quick look reports  
23 with the data from a number of the large-scale  
24 integral tests and the staff has started the analysis  
25 of the tests as well as us. So, that program is --

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1 the testing portion of that program is basically  
2 completed.

3 COMMISSIONER REMICK: Do you know if the  
4 staff has benchmarked the NRC codes with the data?

5 DOCTOR HOCHREITER: They're doing that  
6 right now.

7 COMMISSIONER REMICK: They're doing it  
8 now?

9 DOCTOR HOCHREITER: Yes. I know that  
10 they've released -- we released more reports to the  
11 staff than they have released to their contractor  
12 doing the analysis. So, they're waiting to get some  
13 analysis back from their contractor before they  
14 release the rest of the reports. That particular  
15 program has worked out very well, I think. They're  
16 getting the data now and they're able to do their  
17 calculations on it.

18 COMMISSIONER REMICK: Is the contractor in  
19 this case INEL?

20 DOCTOR HOCHREITER: I believe the  
21 contractor is Los Alamos and Sandia is also involved.

22 (Slide) Next transparency.

23 We also ran some additional DNB critical  
24 heat flux experiments. The reason for this was that  
25 in the AP600 we have canned motor pumps. Now, we've

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1 taken pains to increase the inertia of the pumps, but  
2 the pumps do coast down faster than pumps in existing  
3 Westinghouse reactors. So, the concern was that we  
4 would be at the low flow limit of our DNB correlation.  
5 So, we've specifically run tests to expand the  
6 database down into the lower flows that you would get  
7 for transients like steam line break or loss of flow  
8 or loss of power to the pumps and this type of thing.

9 The testing was completed at the end of  
10 February and they've started the analysis of that  
11 data. The intent will be to extend the correlation  
12 with the same confidence down into the lower flow  
13 range. That correlation will then go into our  
14 transient analysis codes and then when we run the  
15 other Chapter 15 transients we'll be using that  
16 correlation.

17 (Slide) Next slide, please.

18 So, in summary, we believe we've got a  
19 well thought out test program and it's been coupled to  
20 the analysis because we've allowed the analysis to  
21 indicate the areas where the data was needed for  
22 computer code validation. The purpose of the program  
23 is really to generate that kind of data so we can  
24 validate our computer codes and then use those codes  
25 with confidence to predict the AP600 system behavior.

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1 The data that we do generate we'll be using for our  
2 codes, but the NRC will be also using to validate its  
3 own codes. We've come up with a method where we're  
4 trying to get them early release of the data so that  
5 they can start their work doing the code analysis.

6 We believe we've benefitted from the  
7 reviews that we've had with the staff and with the  
8 ACRS. I really think that we've been able to come up  
9 with a very good working relationship in this fashion  
10 because everybody is basically in the same boat  
11 because we're all going to use the same data. So,  
12 that, I think, has really helped us. We do have open  
13 issues and we will be working to close those issues  
14 with the staff.

15 CHAIRMAN SELIN: I have a couple  
16 questions. First, a generic question. How much, if  
17 at all, does your test program depend on anything  
18 coming out of the General Electric program?

19 DOCTOR HOCHREITER: Nothing that I'm aware  
20 of. Nothing.

21 CHAIRMAN SELIN: Okay. So, it's  
22 completely independent from --

23 DOCTOR HOCHREITER: Yes.

24 CHAIRMAN SELIN: Second is quite a  
25 different question. This set of tests, of course, is

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1 more to validate the analytical methods and the codes.  
2 I have a question concerning a particularly important  
3 subsystem and that's the automatic depressurization  
4 system. Could you -- it's a system that has to  
5 operate in some ways in a very sensitive fashion based  
6 on small changes to, say, small break LOCAs and yet  
7 has to be able to be very robust if there are large  
8 changes where the compliance could be quite  
9 considerable, the challenge could be quite  
10 considerable. Could you describe in broad terms just  
11 how the components in the system are to be  
12 demonstrated?

13 MR. RON VIJUK: I can speak to that, I  
14 think.

15 DOCTOR HOCHREITER: Okay.

16 MR. RON VIJUK: We are in Vapore in Italy  
17 running the ADS tests. We are running as part of  
18 design certification to provide the information for  
19 the codes, what we have called systems tests. This is  
20 to get the overall thermal hydraulic performance of  
21 the system, that is the piping and components, from  
22 the pressurizer through the spargers in the large tank  
23 inside containment and the behavior of the sparger  
24 itself.

25 We ran in '92, I guess it was, single

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1 phase steam tests in that system. We will be running  
2 this year two phased tests in that system. At this  
3 stage we will have modeled the piping and simulate the  
4 valves in the ADS package that sits on top of the  
5 pressurizer. In tests outside of certification, we  
6 will be qualifying specific valves and selecting  
7 specific valves as part of the first-of-a-kind  
8 engineering program and that will --

9 CHAIRMAN SELIN: I have a concern. It's  
10 not analytical concern, it's more of a gut engineering  
11 concern about the ability of the components,  
12 particularly the valves, to operate reliably with  
13 large challenges and still delicately with small  
14 challenges. Now, this is clearly not an analytical  
15 question, it's a question of qualifying the valves in  
16 a very large range of environmental questions. Could  
17 you talk a little bit more about how that --

18 MR. RON VIJUK: Sure. The main technical  
19 concern or engineering concern with these valves is  
20 that they see high delta p, high flow rate and they  
21 have to be able to stroke open.

22 CHAIRMAN SELIN: Right.

23 MR. RON VIJUK: There are a number of  
24 engineering things we're doing to make the valves  
25 reliable. They are slow operating valves, first of

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1 all. They don't need to open fast. We can open them  
2 slowly so you can size the operator and gear the  
3 operator so that you can open the valve with some  
4 confidence that you can get the thrust on the --

5 CHAIRMAN SELIN: What do you mean gear the  
6 operator?

7 MR. RON VIJUK: Gear the operator?

8 CHAIRMAN SELIN: Yes.

9 MR. RON VIJUK: For a given size motor you  
10 can use gearing to put additional thrust on the  
11 opening mechanisms of the valve.

12 CHAIRMAN SELIN: I see.

13 MR. RON VIJUK: And when you open them  
14 more slowly, you can use a bigger gearing ratio. That  
15 plus we recognize that we have to qualify these valves  
16 and that's what we'll be doing in first-of-a-kind  
17 engineering and then it qualification tests as we go  
18 into the first procurement of these valves. This has  
19 been a significant issue with utilities and with the  
20 staff and we have discussed this in considerable  
21 detail the approach we are taking to qualify these  
22 valves. I think we have a sound engineering basis for  
23 proceeding as we go along.

24 CHAIRMAN SELIN: The slow opening, I  
25 gather, would also make them reasonably reliable when

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1 you have small delta ps and small deltas when you need  
2 to be sensitive to, say, small breaks or slowly  
3 changing --

4 DOCTOR HOCHREITER: We have a large delta  
5 p with a small break.

6 MR. RON VIJUK: Yes. The biggest  
7 challenge on these valves is the small break, in fact.  
8 The small break LOCA, the system doesn't depressurize  
9 on its own and we're relying on these valves to more  
10 rapidly depressurize the system so the gravity  
11 injection systems can take over. It's the 2500 psi is  
12 what your initial delta P is across those valves and  
13 then you have critical flow basically going through  
14 the valve as you're stroking it open and subsequently.  
15 Verifying that the valves will stand up under that  
16 kind of flow condition is what we will have to do and  
17 is part of our plan to do.

18 CHAIRMAN SELIN: Thank you.

19 Commissioner Remick, did you have more  
20 questions?

21 COMMISSIONER REMICK: No.

22 CHAIRMAN SELIN: Okay. Mr. Bruschi?

23 MR. BRUSCHI: We'll continue.

24 CHAIRMAN SELIN: It's doesn't mean assent,  
25 but at least --

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1                   MR. BRUSCHI:    Bob Vijuk is our next  
2 presenter and will discuss the AP600 design  
3 certification schedule.

4                   MR. ROBERT VIJUK:   Larry presented the  
5 test program as we know it today.  What I'm going to  
6 discuss is the planning that went into the test  
7 program and in particular the scheduling of activities  
8 and associated activities such as code V and V.  We  
9 have constructed an integrated schedule in  
10 considerable detail and we have shared that with the  
11 staff in considerable detail over the past six weeks.  
12 We believe we're in fair agreement on it too.

13                   Let me start by pointing out that at the  
14 time of the last meeting two years ago, this program  
15 would have completed its tests by December of last  
16 year.  That indeed has not occurred.  Even though  
17 we've got substantial testing under our belt, there  
18 are these major ones that Larry talked about that are  
19 still ongoing and one yet to be started, the OSU test.  
20 We slipped for a number of reasons.  We increased the  
21 scope of the program.  The most dramatic change was  
22 the addition of SPES to the program and changes at OSU  
23 where we went from an originally planned 50 psi  
24 plexiglass model to an all stainless steel almost  
25 replica at quarter height of the AP600.

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1                   CHAIRMAN SELIN: My impression was that in  
2 spite of the fact that this was known at the time of  
3 your last presentation, you really hadn't had the  
4 chance to pour that back into your schedule. So there  
5 was a little bit of a disconnect between the guidance  
6 and the schedule that came out of the guidance in the  
7 1992 presentation. Is that right?

8                   MR. ROBERT VIJUK: That's correct. For  
9 example, on the OSU, the magnitude of the  
10 instrumentation and the system checks and the  
11 construction work that it would take to fit all of  
12 that equipment into that test bay they had out there  
13 was quite a challenge and we ended up applying multi-  
14 shift work where we had construction going on on day  
15 shift and cold flow and volume checks going on on  
16 second shift just to get to where we are. It took a  
17 huge effort. We're back on track now though and  
18 pretty confident that we will start testing as  
19 planned. Then the tests will play out.

20                   CHAIRMAN SELIN: To say it differently,  
21 there was a slip, a one-time slip, but the relative  
22 dates have not shifted once you hit your first  
23 milestone. In other words, once you started testing,  
24 you don't expect the actual testing to take longer  
25 than you did.

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1 MR. ROBERT VIJUK: We actually put some  
2 extensions into the testing time because another of  
3 the things that we factored in was the interactions  
4 with the staff. We added tests to the matrices to  
5 come to closure. We added blind tests which were  
6 not -- some independent blind tests, which adds to the  
7 test time and then adds to the analysis time. We went  
8 back and did scaling work and those things added to  
9 the overall schedule as we understood it two years  
10 ago. We believe it's been beneficial, even though  
11 we'd like to not have suffered that delay.

12 CHAIRMAN SELIN: Well, it's still a lot  
13 more streamlined than the original idea, which was to  
14 build a prototype.

15 MR. ROBERT VIJUK: That's correct.

16 CHAIRMAN SELIN: And to conform. Not that  
17 you're questioning this, but I do feel obligated to  
18 point out that the staff is called on to make a major  
19 judgment based on extrapolating a number of individual  
20 tests in quite an unfamiliar environment. It's  
21 obligatory for them and for the Commission that this  
22 be able to be made with a high degree of confidence.

23 MR. ROBERT VIJUK: Yes, we understand  
24 that.

25 As far as developing additional confidence

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1 in our schedule, we put a lot of rigor in developing  
2 the schedules, including, for example, the schedule to  
3 complete OSU where we started really from scratch. We  
4 sent an assessment team in of experts from both within  
5 our company and from utilities and from the Department  
6 of Energy and walked down what was there and reviewed  
7 procedures and set the complete plant forward with 600  
8 events in the logic train to get that facility ready  
9 to start testing.

10 We went all around the circuit with such  
11 assessments in developing the schedule that I'll  
12 ultimately show you today. We developed a very  
13 discrete logic and we have about 1,600 events in our  
14 total logic trains, and that's the detailed schedule  
15 that we've submitted to the staff and they are  
16 reviewing it.

17 Another thing we did as we faced the  
18 realities and the delays we were going to have in the  
19 actual execution of the test is we went back and  
20 reordered some of the tests to optimize the timing so  
21 that the staff could get key results at the earliest  
22 possible date from the tests, and tests that tended to  
23 be somewhat less important or somewhat redundant with  
24 early tests were moved to later in the series. This  
25 will appear later as what we call category 1s and

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1 category 2s where we were aiming our category 1 tests  
2 to be all competed at the time the staff would write  
3 their draft safety evaluation report.

4 We factored in the code development  
5 activities that have to run in parallel with execution  
6 of the tests and lead to code V&V. And as I mentioned  
7 before and Larry mentioned, the blind tests add a  
8 serial piece to that because you get the code all  
9 ready and then you do a final check against the tests  
10 for which the data is locked up to see how well you  
11 do, and the proof of the pudding is in the eating.

12 We have planned for intermediate  
13 deliverables to the NRC staff as we go, rather than  
14 just waiting for a final bulky report at the end as a  
15 means of expediting the review process. Feedback from  
16 the staff is critical to us at this point. We've  
17 talked about the meeting this afternoon. We've talked  
18 about the test programs in detail and refined it in  
19 detail over the last two years.

20 We believe we're close to closure. We're  
21 running tests. We're about to start the last of our  
22 test programs. It's imperative to the program that we  
23 do reach an agreement on essentially the bounds of the  
24 test program so that we can get on with it with  
25 confidence and then take facilities off-line with

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1 confidence when we've completed our test series.

2 We have selected for planning purposes a  
3 single draft safety evaluation report which, as our  
4 schedule logic would play out, it would be possible to  
5 be issued to us in December of 1994. This report  
6 would cover most of what's submitted in the safety  
7 evaluation report and it would have some holes because  
8 of the -- in the area primarily of safety evaluations  
9 that depend on test results to validate codes and  
10 understand phenomena.

11 The next event in the schedule would be an  
12 FDA in June of 1996 to get from the early part of the  
13 DSER part of the testing part to the FDA. We use the  
14 same sequence and timing that was used to develop  
15 SECY-93-097 and strung that out through time. We  
16 formally transmitted this schedule to the staff on  
17 March 29th and reviewed it several times with them  
18 prior to that and they have it in all of its detail.

19 (Slide) Next slide, please.

20 We had a meeting with the staff at the  
21 senior management level on March 14th and this  
22 viewgraph summarizes from our perception of what  
23 transpired at that meeting. Both parties seem to be  
24 working towards the single draft safety evaluation  
25 report in order to get that report out in the later

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1 part of 1994. Cutoff dates were established for  
2 providing inputs to the staff. Those cutoff dates are  
3 June 30th, 1994, for non-testing results and July 31st  
4 for testing results that will affect that particular  
5 DSER.

6 COMMISSIONER REMICK: I could read that  
7 two ways, a single DSER or a single schedule. It's a  
8 single schedule, but two parts of the DSER?

9 MR. ROBERT VIJUK: No, one part to the  
10 DSER.

11 COMMISSIONER REMICK: And how do you  
12 handle the code development?

13 MR. ROBERT VIJUK: We would handle that in  
14 the FSER.

15 COMMISSIONER REMICK: FSER, I see. Okay.

16 MR. ROBERT VIJUK: And in DSER responses,  
17 because as we're preparing our responses our tests  
18 will be finishing up.

19 COMMISSIONER REMICK: So there will be  
20 open items that will be handled in the FSER?

21 MR. ROBERT VIJUK: That's correct, and  
22 they'll be large open items in the test area, in the  
23 safety analysis area, and a couple other small areas.

24 Statements were made at the meeting that  
25 we appear to be within one month of one another in

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1 terms of our planning and schedule understandings.

2 (Slide) Next slide, please.

3 Moving on to the RAIs that we've received,  
4 this graph depicts the ones we've received and the  
5 ones we've answered. To date we've received 1,408  
6 RAIs and we've responded to 1,240 of them. You see a  
7 recent step of 100 in mid-March of RAIs received.  
8 This was shortly after the senior management meeting  
9 where we discussed them. We anticipated them. The  
10 staff was working hard to get them out to us at that  
11 time. We now have --

12 COMMISSIONER REMICK: Are you  
13 communicating back and forth on paper or  
14 electronically?

15 MR. McINTYRE: Electronically.

16 COMMISSIONER REMICK: Good.

17 MR. ROBERT VIJUK: We also recognize that  
18 there are several other batches still being prepared  
19 and we would hope to receive them quite soon, because,  
20 when you take the 90 day response time that we shoot  
21 for and you look at the cutoff dates that I just  
22 mentioned, the time is now as far as the need to  
23 receive the last RAIs.

24 CHAIRMAN SELIN: I even noticed that in  
25 Mr. Bruschi's comments. It was very subtle, of

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1 course, but it was there.

2 MR. ROBERT VIJUK: (Slide) Next slide,  
3 please.

4 COMMISSIONER REMICK: How does that  
5 compare with one of the last Westinghouse proposed --  
6 other plants, how many questions, 1,408 compared to  
7 SP-90?

8 MR. McINTYRE: I think for SP-90 we were  
9 on the order of 2,000, but then we had the whole  
10 report in to you and so you were able to ask the  
11 questions on chapter 15 and chapter 6 in safety  
12 analysis areas.

13 COMMISSIONER REMICK: So probably  
14 comparable, then?

15 MR. McINTYRE: Yes.

16 MR. ROBERT VIJUK: One of the other  
17 vendors that just went through this process had about  
18 2,000, so it's certainly in the right range.

19 (Slide) Slide 24, please.

20 This is a top level summary of the  
21 schedule that I've talked about. It shows the timing  
22 of the tests, the actual execution of the tests, and  
23 then it shows below that the analytical work that's  
24 associated with verifying and validating the computer  
25 codes, and then on down at the bottom the actual

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1 licensing submittals that we make and the review  
2 processes that the staff goes through.

3 There are three key dates on this schedule  
4 that will drive us. The first one is the one at the  
5 end of March, 1994, saying we will reach closure on  
6 the testing, and that is what we've targeted for to  
7 occur yet this week. The second one is the DSER and  
8 it shows up right near the end of the year on our  
9 schedule, sometime in December. And the final one is  
10 the FDA in June of 1996. We would hope that we can  
11 reach an agreement on a schedule such as this in the  
12 very near term.

13 COMMISSIONER REMICK: This shows that the  
14 ITAAC review basically is not far along. Is that  
15 correct?

16 MR. McINTYRE: The schedule that's there?  
17 For ITAACs, we submitted the ITAACs in December of  
18 1992.

19 COMMISSIONER REMICK: Right.

20 MR. McINTYRE: And we have found, learned  
21 from the industry experience, that it doesn't  
22 necessarily pay to try to resolve the ITAACs until we  
23 have resolved the outstanding design issues. So they  
24 are in -- if you look at the way that they're phased  
25 right now, the intent is that we have a couple of

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1 policy issues with the staff. Because it's a passive  
2 plant, we took a little different approach than the  
3 evolutionary plants did. And the regulatory treatment  
4 of non-safety systems also needs to factor into that,  
5 because that's going to affect how you would write the  
6 ITAAC, so we have a couple of things that need to move  
7 along a little further before we really start an  
8 intense ITAAC review.

9 COMMISSIONER REMICK: Are you proposing  
10 DAC also?

11 MR. McINTYRE: Yes.

12 COMMISSIONER REMICK: How many?

13 MR. McINTYRE: Well, the two that quickly  
14 come to mind are going to be piping and the man-  
15 machine interface, the chapter 18 area.

16 COMMISSIONER REMICK: Okay.

17 CHAIRMAN SELIN: Are there any items in  
18 the critical path that are under neither your control  
19 nor the staff's control in this area and where you're  
20 depending on third parties?

21 MR. ROBERT VIJUK: No, we do not depend on  
22 any third parties. We do depend on success in the  
23 test program. And I should point out that when we  
24 talk about closure on the test program, that's barring  
25 any surprise where it might happen.

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1                   CHAIRMAN SELIN:     Let me ask you a  
2 different question on the schedule. It's not really  
3 on this schedule. It's on the second schedule there.  
4 Is it your opinion that the first-of-a-kind  
5 engineering schedules are consistent with this  
6 schedule or do they continue to expect too much too  
7 soon? Have they been brought into compliance with --

8                   MR. BRUSCHI:     They are consistent. We  
9 have reviewed very carefully with the utilities, in  
10 fact, the deliverables for first-of-a-kind  
11 engineering. Those that we emphasize early on are  
12 those that are not dependent on the certification  
13 milestones. We've been very careful to do that, and  
14 by contract the first-of-a-kind engineering program  
15 will not end until the FDA and certification programs  
16 have completed.

17                   MR. ROBERT VIJUK:   (Slide) Slide 25,  
18 please.

19                   This slide summarizes our recent and  
20 upcoming submittals. We updated the safety analysis  
21 report in January of 1994 to basically incorporate all  
22 the responses to the RAIs that we had processed  
23 through late 1993.

24                   We are currently working on an update to  
25 the PRA. This will incorporate our responses to RAIs

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1 in that area as well as a requantification of the  
2 level 2 PRA work. We expect to get that in to the  
3 staff by the end of this month and we will work  
4 sometime after that on level 1 updates. And the main  
5 reason we aren't working full-bore on level 1 at this  
6 point is we are waiting for additional interactions  
7 with the staff and with our consultants, and Brian  
8 will talk more about that subject in a few minutes.

9 We continue to meet the 90 day turnaround  
10 required on RAIs and that we proposed on RAIs, and, as  
11 I mentioned earlier, that means the time is now if  
12 we're to meet the schedules that we're shooting for.

13 Thank you.

14 COMMISSIONER REMICK: I will be visiting  
15 the OSU facility next week and so I had a briefing  
16 from the staff. I am impressed that that's a far  
17 different facility than I thought it was a few years  
18 ago or going to be a few years ago. It's really now  
19 quite a significant facility. I think from a  
20 schedular standpoint it's going to be tough to keep  
21 people from wanting to do lots of things on that  
22 facility because it really looks like a miniature  
23 AP600 to my mind. It's really a very, very valuable  
24 test facility. I can see that there will be a  
25 tendency to want to do more because it can be done

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1 more. More can be done.

2 MR. BRUSCHI: Indeed it is quite an  
3 impressive facility. We're very pleased with the  
4 quality of the work that's gone into it. I think it  
5 is important that we distinguish between those tests  
6 required for design certification, and, if there are  
7 post-certification tests that ought to be done, by all  
8 means we ought to take advantage of that and perform  
9 them.

10 Our next speaker is Brian McIntyre, who's  
11 going to speak about some of the technical issues  
12 associated with the AP600.

13 Brian?

14 MR. McINTYRE: (Slide) May I have slide  
15 27, please?

16 The first issue that I want to talk about  
17 is the use of PRA as a design tool for the AP600. We  
18 started this design back in 1985. We had our first  
19 EPRI contract to develop the conceptual design, and  
20 traditionally the way a vendor does a design is you go  
21 in and you do a lot of deterministic analysis. You  
22 try to get the peak clad temperature down. You try to  
23 get the DNBR up for the transients.

24 In this case we used PRA in conjunction  
25 with deterministic methods. It was an iterative

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1 process. We'd go and we'd do deterministic  
2 calculations and analyses and we'd go back then and  
3 look at it from a PRA standpoint. What we used, we  
4 probed the design for areas where we felt improvements  
5 could be made at a fairly reasonable level and we  
6 found three areas of improvement.

7 We looked at things in the success  
8 criteria, and those are the things where -- what  
9 equipment do you really need to have necessary to  
10 mitigate a core damage event? We found things like,  
11 well, we can get by with one accumulator for the  
12 large LOCA, but, by gosh, you really better have it,  
13 so that needs to be a very reliable system. For small  
14 LOCA, we found that, well, you need an accumulator of  
15 the core make-up tank in that case can help. So we  
16 used that basically to identify the components where  
17 we needed to do some work or we could do some work.

18 We also looked at it from an operational  
19 standpoint. And this doesn't necessarily come through  
20 in the design, but it's things like you need to have  
21 the passive core cooling features available during  
22 shutdown. You shouldn't just be running on simply the  
23 non-safety systems, the active non-safety system. You  
24 should have the passive safety systems also available.

25 We made a number of design changes.

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1 CHAIRMAN SELIN: Say that again, Mr.  
2 McIntyre?

3 MR. McINTYRE: During shutdown while you  
4 are using the normal RHR system, you also have the  
5 passive heat removal systems available at that time.

6 CHAIRMAN SELIN: Is it a policy conclusion  
7 or is it a result of the analyses?

8 MR. McINTYRE: Well, it's the result of  
9 analyses. It's something that we went back and made  
10 happen. It gets us a much better core damage  
11 frequency.

12 We made a lot of design changes as a  
13 result of the PRA.

14 We added diversity to the four-stage  
15 valves. The first, second, and third stages are motor  
16 operated. The fourth stage is an air operated valve.

17 We expanded the capabilities of the non-  
18 safety diverse actuation system. At one point it was  
19 just trip the reactor and start the passive RHR  
20 system. It actuates now more of the safety features.

21 COMMISSIONER REMICK: Excuse me, Brian.  
22 You remind me of something I meant to ask earlier  
23 having to do with the ADS. You're talking about  
24 stages of ADS, I assume?

25 MR. McINTYRE: Yes.

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1                   COMMISSIONER REMICK: How many valves in  
2 each stage?

3                   DOCTOR HOCHREITER: In the first three  
4 stages there's two valves each.

5                   COMMISSIONER REMICK: Two valves.

6                   DOCTOR HOCHREITER: In the fourth stage  
7 you have a train off of each hot leg. You'll have two  
8 valves in each hot leg, so there's a total of four for  
9 the fourth stage.

10                  COMMISSIONER REMICK: So a total of how  
11 many valves?

12                  MR. RON VIJUK: There's 20, actually.  
13 There's redundant paths, and that's what Larry was  
14 leaving out, so for each of the -- there's four first  
15 stage valves, four second stage valves, four third  
16 stage valves, and eight fourth stage valves.

17                  COMMISSIONER REMICK: Thank you.

18                  MR. McINTYRE: We made the core make-up  
19 check valves normally open. They're biased open, so  
20 we're not depending on the check valve. You don't  
21 have to worry about it getting sealed shut in any way.  
22 That helps the result, because it improves the  
23 reliability and availability of that check valve.

24                  And we also added for the IRWST for  
25 injection. In the original design of the plant that

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1 was two check valves in series and now it's parallel  
2 paths of two check valves in series. Again, going  
3 back, looking, we actually made design changes to the  
4 plant as a result of looking at the PRA.

5 We also looked at severe accident  
6 insights. And these are things that you won't  
7 necessarily find in the SAR but you'll see in the PRA  
8 report. It's things like adding the capability for  
9 the operator to flood the area under the vessel.  
10 There are motor operated valves that he can, if he  
11 needs to, open a valve and flood the area under the  
12 vessel for a severe accident if for some reason the  
13 check valves or some other features of the plant  
14 haven't worked.

15 We find that the AP600 has an extremely  
16 robust containment. We haven't found any event  
17 sequence yet that fails the containment, so what we  
18 find is we need to look very hard at the containment  
19 isolation. It must be very reliable. In a severe  
20 accident management strategy, we would look at things  
21 like maintaining the secondary side at a higher  
22 pressure and not depressurizing to make sure you don't  
23 have a thermally induced steam generator tube rupture,  
24 making sure that there's water in there. These are  
25 insights that will find their way into the severe

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1 accident management type guidance.

2 (Slide) Can I have the next slide,  
3 please?

4 Regulatory treatment of non-safety  
5 systems. That is really --

6 COMMISSIONER REMICK: Brian, before you  
7 leave that, I'd just like to make a comment because I  
8 want to applaud that use of PRA. That was certainly  
9 the original intent, I think, of the Commission when  
10 they required the PRA at design stage. But I think  
11 some people didn't really get the message and do the  
12 design and then do a PRA afterwards. But it's much  
13 easier to do it in parallel and use the insights that  
14 you get from the probabilistic as well as the  
15 deterministic in making design decisions.

16 MR. McINTYRE: Absolutely.

17 COMMISSIONER REMICK: So, I really applaud  
18 that approach. I think it's a very, very valuable use  
19 of PRA.

20 MR. McINTYRE: Regulatory treatment of  
21 non-safety systems is really the big issue in the  
22 review right now. Basically, I look at it as the  
23 viability of being a passive plant depends on a  
24 successful conclusion for us. We have reached  
25 agreement with the staff. It was an industry staff

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1 agreement. We started back in January of last year  
2 and in May we reached agreement on the approach that  
3 would be taken to look at -- it's both -- and again,  
4 it's a combination of probabilistic, deterministic to  
5 resolution. It's to do a PRA that looks at both at-  
6 power and shutdown conditions for both internal and  
7 external events and external events excludes seismic  
8 because we're not a seismic PRA, it's a seismic  
9 margins approach. We're going to show, we have shown,  
10 that the Commission safety goal of  $10^{-4}$  for the core  
11 damage frequency, and at the time we wrote this it was  
12  $10^{-6}$  for a large release, but we understand that the  
13 ACRS letter on the RTNSS SECY encourages to not go to  
14 that and look at a conditional containment failure  
15 probability as an approach. We think that we still  
16 will be okay with that too.

17 Basically what this is is you do a PRA  
18 without the non-safety systems because when you do a  
19 PRA normally you've got everything in there and this  
20 is just with the non-safety systems and showed that  
21 yes, indeed, we can meet the requirements just for the  
22 safety systems, and this is called the focused PRA.

23 We also looked at initiating event  
24 frequencies for both the at-power and the shutdown  
25 events. You go back and you look and see for a given

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1 initiating event is there some system that would be  
2 very important to that event. Then deterministically  
3 we went through and we looked at things like ATWS,  
4 station blackout, in our case beyond 72 hours and  
5 adverse systems interactions. Again, is there some  
6 place in there that a system is very important?

7 We reached that agreement with the staff  
8 on -- it was basically finalized on May 20th. On the  
9 24th of September, Westinghouse was down here with our  
10 submittal. We'd actually started. Obviously we  
11 didn't within three months. We started back in  
12 January working on it. We had our submittal in  
13 September and that included also a review by the  
14 people on the ALWR utility steering committee to get  
15 some utility input because their input, as far as  
16 operation of the plant -- they know a lot of things  
17 and we try to take credit for that where we can and  
18 benefit for it.

19 The results of that were that through the  
20 PRA we captured no systems.

21 CHAIRMAN SELIN: What is that?

22 MR. McINTYRE: We ran the PRA without the  
23 non-safety systems and showed that we met the  $10^{-4}$   
24 criteria and at that time the  $10^{-6}$  criteria. So, from  
25 a PRA standpoint, there were no systems captured.

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1           From the deterministic events, the 72  
2 hours and the ATWS and those things, we found parts of  
3 two systems that were important. They were captured  
4 through ATWS and those parts of the systems are the  
5 turbine trip and passive RHR actuation functions of  
6 the diverse actuation system. Once you have that  
7 system, you need some power to run it. So, the non-  
8 class 1EDC uninterruptible power supply that powers  
9 that DAS function needs to be available.

10           Looking at the shutdown initiating events,  
11 we found there were five systems that were important  
12 in that case because these are the systems that are  
13 providing the shutdown decay heat removal support  
14 during reduced RCS inventory conditions. This is  
15 where, I think, the help from the utilities came in  
16 very handy to us. We decided to include one system  
17 that wasn't captured, but we just decided it would be  
18 included to provide the utilities the operational  
19 flexibility and that was the diesels, the on-site  
20 standby power. So, they are in regulatory treatment  
21 of non-safety systems as a system that's important.

22           We also proposed to the staff what sort of  
23 regulatory oversight we thought was appropriate for  
24 this. This was the submittal that we made in  
25 September.

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1 (Slide) Can we have the next slide,  
2 please?

3 We met with the senior staff on October  
4 26th and it was a very positive reaction. It was a  
5 very high-level reaction. This is what they were  
6 looking for back when we thought about it, however you  
7 need to work out the details with the staff. It's  
8 another devil in the details situation. So, we met  
9 with the staff in November. We provided an overview,  
10 basically the same presentation that we had done to  
11 the senior management and they were much more  
12 concerned about the details. The big question that  
13 came up, clearly you need to have a lot more  
14 discussion because this is a significantly different  
15 approach than you find in the standard review plan.  
16 It's different, we're going to have to talk a lot  
17 about it.

18 The issue that really came up was, well,  
19 your focused PRA didn't capture any systems, but we  
20 haven't reviewed your PRA in detail yet. So, I  
21 wouldn't say it's on hold, but it's clearly the issue  
22 now. So, regulatory treatment is important to us, but  
23 the PRA needs to be done to really close that issue  
24 out.

25 So, our next action for RTNSS is we're

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1 going to try to work out a system, pick a system and  
2 work through all the details. We had a meeting two  
3 weeks ago with the plant system branch and we found  
4 three systems that are candidates with the normal HVAC  
5 system, the service water or the component cooling  
6 water. We're going to take one of those systems and  
7 sit down and over the summer just beat out, assuming  
8 that what we've turned in passes muster, that the PRA  
9 results work out and that the initiating events and  
10 those items are fine. We're going to pick one system  
11 and work through it as a model.

12 COMMISSIONER REMICK: Brian, if I  
13 understand, you're saying that that was not identified  
14 through your focus PRA, but to take that and see --

15 MR. McINTYRE: No, the service water was.

16 COMMISSIONER REMICK: The service water.  
17 I see. Okay.

18 MR. McINTYRE: The service water was and  
19 the component cooling water were. HVAC wasn't.

20 COMMISSIONER REMICK: Okay. And why have  
21 you included HVAC then?

22 MR. McINTYRE: I wasn't at the meeting.  
23 I think they were surprised that it wasn't.

24 COMMISSIONER REMICK: I see.

25 MR. McINTYRE: Because I think they were

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1 just surprised that it wasn't. That's the way I would  
2 describe it.

3 COMMISSIONER REMICK: So, in the case of  
4 HVAC it would be looking at why wasn't it identified?

5 MR. McINTYRE: Right.

6 COMMISSIONER REMICK: Otherwise, on the  
7 other systems and possibly that one, it's working  
8 through selecting this as a safety system, how you're  
9 going to handle it --

10 MR. McINTYRE: Well, not selecting it as  
11 a safety system. It's still a non-safety system.

12 COMMISSIONER REMICK: Non-safety system,  
13 but what you're going to do about a graded approach to  
14 it?

15 MR. McINTYRE: Yes, the proposed  
16 regulatory oversight, what would be appropriate.  
17 Given that it's this important, and if you're going to  
18 grade it, how it falls on the grading curve. We think  
19 the normal HVAC is not on the grading curve. These  
20 other two are at a lower level.

21 COMMISSIONER REMICK: Okay.

22 MR. McINTYRE: Not full safety grade.

23 COMMISSIONER REMICK: I understand, yes.

24 MR. McINTYRE: (Slide) May I have the  
25 next slide, please, which brings us to the PRA review.

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1           It's very important to us, the regulatory  
2 treatment of non-safety systems. When Dennis  
3 Crutchfield briefed you at the end of January, that  
4 was the staff critical item. Ours was testing, the  
5 staff's was getting the PRA questions. We received at  
6 this point 271 questions. Fifty percent of them were  
7 questions on how do the systems work, how are these  
8 things connected, how do they interrelate. Twenty-  
9 five percent were on level 2 PRA and 25 percent were  
10 on level one.

11           We've pushed the staff to have a  
12 discussion, sit down and talk about the RAIs. In  
13 February we had what I thought was an excellent  
14 working level meeting with the staff. They brought  
15 the contractors in from INEL. Each person within  
16 their area of specialty went through, explained what  
17 his concerns were. We were able to dialogue on it.  
18 It's clear that the staff is interested in having a  
19 dialogue on the PRA. The good news to us is that we  
20 found no real show stopping issues. There were no,  
21 "Oh, my Gods," and we thought that was very positive.  
22 The requests were things, "We need more information on  
23 this system. We don't quite understand how this  
24 works, or we want to talk about how you applied this  
25 methodology to this particular situation."

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1           During that meeting in February, the staff  
2           commented that they would get the RAIs in from INEL,  
3           they'd go through a review and they'd be prepared to  
4           meet with us in four to six weeks, which is about now  
5           or in the next couple of weeks. So, really for us, we  
6           think that the PRA review is the essential item for  
7           RTNSS and it's where we're going to be focusing an  
8           awful lot of activity in the next couple of months.

9           CHAIRMAN SELIN: You don't know that you  
10          have a problem and therefore you haven't spent a whole  
11          lot of time trying to figure out how you resolve an  
12          issue if you and the staff come up with different  
13          probabilities from doing --

14          MR. McINTYRE: We don't know that we have  
15          that problem, yes.

16          (Slide) Next slide, please.

17          COMMISSIONER REMICK: Before leaving the  
18          PRA, in modern PRAs or in your own case, are people  
19          attempting to identify a conditional probability of  
20          going from initiation of core damage to core-on-the-  
21          floor? Is there -- what's the current state-of-the-  
22          art and the probability of once you've initiated core  
23          damage, the probability that you'll go through the  
24          vessel? Is there any attempt to quantify that?

25          MR. McINTYRE: It's a number that will

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1 fall out of the calculation because you'll have --  
2 that just is working through those event trees.

3 COMMISSIONER REMICK: Do you know what  
4 kind of a number that's coming out to be these days?

5 MR. McINTYRE: I don't.

6 Ron?

7 DOCTOR HOCHREITER: I know we looked at  
8 that.

9 COMMISSIONER REMICK: I'd appreciate it if  
10 you'd provide that in follow-up.

11 CHAIRMAN SELIN: I have a question I'd  
12 like to ask you maybe at this point. It's not really  
13 a certification question, but it is a question that  
14 I'm concerned with once these plants become  
15 operational. There's a very strong economic incentive  
16 to try to use the active systems and not go to the  
17 passive systems, maybe to the point where the analysis  
18 in the PRA assumes the initiation of the passive  
19 systems, but the operating procedures might try to use  
20 the active systems first. At some point do you and  
21 have you yet tried to take a look at sequences where  
22 the assumptions on the early initiation of the passive  
23 systems might not happen in practice? Or more  
24 importantly, that using the active systems first might  
25 put some of these rock bottom passive safety systems

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1 at risk because they might not initiate until too late  
2 in the cycle.

3 MR. McINTYRE: Yes. I don't think we've  
4 looked at that from a PRA standpoint, but those were  
5 the types of things that we're looking at in OSU. Of  
6 the things that we added on, we added on, I think  
7 basically, is that right, Larry, the whole suite of  
8 non-safety systems.

9 DOCTOR HOCHREITER: That's correct. There  
10 are tests in the text matrix for both OSU and SPES.

11 CHAIRMAN SELIN: So you would be looking  
12 at places where the resource of the past -- timing the  
13 resource of the past systems might be critical and  
14 people have only so much time to try to contain  
15 problems with active systems, or is that asking too  
16 much at this point? Do you understand what I'm  
17 asking?

18 MR. RON VIJUK: I'd make one comment. The  
19 passive systems are automatically actuated. So there  
20 won't be any decision to make.

21 CHAIRMAN SELIN: Early actuation of the  
22 active systems doesn't change the conditions under  
23 which the passive systems actuate?

24 MR. RON VIJUK: I'm sorry?

25 DOCTOR HOCHREITER: Not if you get an S

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1 signal.

2 MR. RON VIJUK: Right.

3 DOCTOR HOCHREITER: But what can happen,  
4 what you worry about, is if you'd recover the active  
5 systems and the operator would try to turn on the  
6 active systems, what does it do to the passive system  
7 performance? Those are the types of things that we'll  
8 be looking at.

9 CHAIRMAN SELIN: That's a more  
10 sophisticated question. I was more concerned with  
11 operator actions in one way or another delaying the  
12 onset of the passive systems in order to try to do  
13 some economic salvage. That can't happen?

14 MR. RON VIJUK: It's very unlikely, I  
15 think.

16 MR. McINTYRE: And for those cases, those  
17 transients were having active systems operational  
18 makes the result worse. What we submitted on the SSAR  
19 was basically that active system operating, showing  
20 that it would make whatever non-LOCA transient got  
21 worse.

22 CHAIRMAN SELIN: Okay.

23 COMMISSIONER ROGERS: Just before you  
24 leave the regulatory treatment of non-safety systems,  
25 how does the approach that you're coming to together

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1 with the staff compare with the EPRI requirements  
2 team's approach to regulatory treatment of non-safety  
3 systems?

4 MR. McINTYRE: They're identical.

5 COMMISSIONER ROGERS: They're identical?

6 MR. McINTYRE: They're identical.

7 COMMISSIONER ROGERS: They are identical.

8 MR. McINTYRE: Yes.

9 COMMISSIONER ROGERS: Okay.

10 MR. McINTYRE: (Slide) And the last  
11 slide, slide 31, please, is the quality assurance for  
12 our testing programs.

13 There's a lot of question right now as to  
14 these are testing programs, what sort of QA actually  
15 goes on on these things, and particularly the ones  
16 that are not being run in this country. I think it's  
17 a good question. Westinghouse looks at the testing as  
18 something safety-related. There's a little box you  
19 check on our procurement forms, "This is a safety-  
20 related component. Does Appendix B apply to it?" The  
21 answer is we look at this just like any other  
22 component that we're buying. We have -- it applies to  
23 all aspects of the test program. We have what I  
24 personally refer to as a very aggressive internal  
25 audit staff which keeps us right on the line. They go

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1 out, they've done audits at SPES. They do audits at  
2 OSU and they make sure that the equipment is bought,  
3 procured to the right specifications. Everything has  
4 calc notes with independent reviews in accordance with  
5 Appendix B. As a result, we think we have a pretty  
6 high quality test program. I think the staff has gone  
7 around.

8 One of the things that they do when they  
9 visit a site is they look to make sure that you've  
10 got the right procedures in place, that the people are  
11 following them. So, they are doing some audits in  
12 that area.

13 When Howard talked earlier that we're to  
14 the point that the staff is doing audits, the staff is  
15 going out next week to audit some work we're doing at  
16 Bechtel on the piping area. So, they are now to the  
17 point that they're getting down into the lower levels,  
18 not just basically how are you executing it. So, we  
19 expect that the statements I'm making here is going to  
20 be backed up by the audits that the staff is making  
21 right now.

22 Mr. Bruschi?

23 MR. BRUSCHI: (Slide) To conclude our  
24 presentation, I'd just like to summarize four points.  
25 The first has to do with schedule. I think

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1 significant progress has been made with regard to  
2 detailed discussions of our schedule with the staff.  
3 We appear to be very close with regard to our  
4 respective schedules. Our expectation is that what  
5 we've discussed here in the way of schedule and  
6 milestones is where the staff is with regard to their  
7 schedule.

8 The second has to do with a testing  
9 program. We've spent most of our time this morning on  
10 that because it clearly is the key aspect of the AP600  
11 program. We fully recognize that. We also recognize  
12 that we, Westinghouse, must provide sufficient detail  
13 in the integral systems tests that are starting now to  
14 make that DSER substantive. We do recognize that and  
15 we anticipate that the SPES test, the OSU test will  
16 have enough of their initial tests run to provide the  
17 substance necessary for the DSER.

18 The third item has to do with the RAIs.  
19 We're quite prepared to put the resources necessary to  
20 resolve and answer questions that have been raised by  
21 RAIs. We trust that they'll be forthcoming soon so  
22 that we can meet the schedule with regard to the DSER  
23 late this year.

24 Fourthly, as Brian McIntyre discussed, the  
25 regulatory treatment of non-safety systems now needs

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1 that detailed inspection, introspection into that  
2 arena. We have agreement in principle, but the  
3 details need to be worked on.

4 We sense we're on the brink of something  
5 very exciting with the passive plant program. We've  
6 obviously been scrutinized by both the NRC as well as  
7 our utility customers, steering committees, the  
8 Department of Energy, and through that scrutiny the  
9 technical aspects of this design have held up quite  
10 well. We're into integral systems testing now. Early  
11 prospects look very good and our expectation is that  
12 we'll be able to provide the industry with a  
13 simplified plant that is providing substantial safety  
14 and operational margins for our utility customers.

15 This concludes our presentation this  
16 morning.

17 CHAIRMAN SELIN: Thank you.

18 Commissioner Rogers?

19 COMMISSIONER ROGERS: Well, I don't have  
20 any additional questions. I think that the results so  
21 far are really very encouraging, that the process is  
22 coming to closure and the Part 52 seems to be  
23 workable. I think the attention that the staff and I  
24 think the Commission itself has given to seeing that  
25 these reviews are conducted with high priority is

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1 beginning to show some very positive results. I was  
2 very pleased with what I heard today.

3 Thank you very much.

4 MR. BRUSCHI: You're welcome.

5 CHAIRMAN SELIN: Commissioner Remick?

6 COMMISSIONER REMICK: What do you foresee  
7 as the future of the SPES facility when your tests are  
8 completed? Once again, that's an extremely valuable  
9 facility too. I realize it belongs to somebody else,  
10 not the U.S.

11 DOCTOR HOCHREITER: Well, I don't know of  
12 any really long-term plans for the facility. We've  
13 got a very elaborate matrix to look at basically all  
14 the aspects that we expect to be important for this  
15 type of a design.

16 MR. BRUSCHI: I'll make a few comments,  
17 Larry, relative to our colleagues in Italy. They're  
18 eager to see nuclear revitalized in Italy, as with the  
19 U.S. I think unlike the U.S., however, they need to  
20 show a more dramatic change from the current operating  
21 plant. So, the passive plant is extremely important  
22 to them. Therefore, my expectation is that the  
23 facility will stay intact and will be used by our  
24 colleagues in Italy for further testing apart from  
25 design certification to continue to experiment, if you

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1 will, with that facility. I would expect that we can  
2 continue a relationship with them as an industry.

3 COMMISSIONER REMICK: That would certainly  
4 be good and that's -- also, I think the OSU facility  
5 has become such a valuable facility that I hope  
6 there's wisdom in the U.S. that somehow we can  
7 maintain that facility for some time in the future.  
8 I'm sure that OSU could not do it. It's an expensive  
9 facility to operate, I'm sure. But I'm hoping that we  
10 can retain some of these in the U.S. for potential  
11 future needs, and I realize that's not just your  
12 responsibility. I'm speaking hopefully DOE, NRC,  
13 industry and so forth.

14 Some time ago, some months ago, I had  
15 heard some comments from vendors and others about some  
16 concern about NRC release of codes. Not so much to  
17 other countries' regulatory bodies, but the fact that  
18 they eventually got into the hands of international  
19 competitors of U.S. companies and therefore being used  
20 as if they were endorsed by the NRC and in direct  
21 competition with U.S. companies and U.S. taxpayers  
22 paid for the development of those codes.

23 I've asked the staff a question and I'm  
24 hoping that sometime in the near future they're going  
25 to come back with a response. But do you have a

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1 concern along that line and particularly on the AP600,  
2 which of course is strictly a U.S. industry design?  
3 Well, I shouldn't say strictly, but it's certainly  
4 prioritary to you folks. Do you share in those  
5 concerns, and how about with the AP600?

6 MR. ROBERT VIJUK: Yes, we do. As a  
7 matter of fact, a letter was sent to the staff late in  
8 February expressing those concerns. We do compete in  
9 the international marketplace for services,  
10 engineering services that utilize these codes, with  
11 codes that we use as opposed to the ones that the  
12 Commission uses. It does take work away from us and  
13 we don't mind the regulatory bodies of other countries  
14 using U.S. codes, but we don't like them to fall into  
15 the hands of our competitors.

16 DOCTOR HOCHREITER: What we see is a pass  
17 through from the government agency straight to the  
18 industry. In the latest agreement on this CAMP  
19 program, the designated government has named its  
20 industry as the interface with the staff and they get  
21 direct access to the latest versions of the codes,  
22 Siemens, Framatome, Tractebel, and then we wind up  
23 competing for reload analysis, plant upgrade, safety  
24 analysis against basically U.S. developed technology  
25 that another vendor is using and has not had to pay

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1 the cost to do the development of the code, whereas we  
2 pay the cost ourselves.

3 COMMISSIONER REMICK: Does that appear  
4 because we are not placing adequate restrictions or  
5 the restrictions are not being followed?

6 DOCTOR HOCHREITER: I think it's -- in my  
7 opinion, both.

8 COMMISSIONER REMICK: Both.

9 DOCTOR HOCHREITER: Certainly they're not  
10 being followed because I'm aware of the fact that the  
11 staff told these people that they can't use these  
12 codes for commercial purposes and they were very upset  
13 because that was the whole motivation for them being  
14 in this program, was to gain that technology for  
15 commercial purposes.

16 COMMISSIONER REMICK: Yes. It's a  
17 difficult one because we certainly -- I feel very  
18 strongly that our help to foreign regulatory bodies is  
19 in the best interest of the country and certainly  
20 nuclear safety.

21 DOCTOR HOCHREITER: We agree with that.

22 COMMISSIONER REMICK: But I was not aware  
23 of that until some months ago when I heard there was  
24 concern about this flowing through and being used  
25 commercially against the U.S. vendors and U.S.

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1 taxpayers that paid for the code.

2 MR. McINTYRE: Also, I think, Howard had  
3 talked about internationally. I think a point that  
4 Larry was making, I don't think it came through, was  
5 that we're competing in the U.S. and that's the  
6 problem. When you're bidding with a domestic utility  
7 for fuel against a foreign competitor and they're  
8 using basically U.S. developed code as their  
9 technology and offering it to the utility, we have a  
10 hard time with that.

11 COMMISSIONER REMICK: I see.

12 CHAIRMAN SELIN: That sounds like an  
13 argument for tariffs.

14 COMMISSIONER REMICK: Yes. I'd like to  
15 join Commissioner Rogers. Certainly everything that  
16 I've heard from the staff has been complimentary about  
17 the interaction with you folks. And reading the ACRS  
18 letters, I think they've generally been complimentary  
19 also. So I think it's a credit to your attention to  
20 the management of the program that things have moved  
21 along to the point they have. That interaction  
22 certainly has changed from my impression of four years  
23 ago when I'd heard that your preliminary safety  
24 information document had been in-house for a year,  
25 what is now called a preliminary safety information

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1 document, I guess called conceptual design at that  
2 time, but it was in-house for about a year and I was  
3 told unopened. I don't know if that's literally true  
4 or not.

5 Certainly it looks like you have a day to  
6 day interaction with the staff and I compliment you  
7 for your effort and also the staff for their efforts.

8 CHAIRMAN SELIN: I join these remarks.  
9 I'm particularly impressed with the test facilities  
10 and the test program. Clearly the QA is very good.

11 I would really put out just one caution,  
12 and that is that the statement that no show stoppers  
13 have come up is based on an assumption that the PRA  
14 itself holds up. And so, although we don't know that  
15 there are problems on those, as the Scotch like to  
16 say, that's an assertion that's just not proved yet.

17 So, we have to see how the PRAs hold up.  
18 I mean, you've done the analysis. Based on your  
19 analysis, you've convinced us that, if the  
20 probabilistic calculations are right, the engineering  
21 is right. And so a question of great faith, not to be  
22 determined on a policy level but on a detail level, is  
23 will the PRAs hold up to the scrutiny.

24 Clearly you have benefitted from what I'm  
25 sure is a mixed blessing of having two certifications

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1 go before you. The staff got a chance to say, "Well,  
2 I missed this on the last one, but, by golly, I'm not  
3 going to miss it this time, and so get it right the  
4 first time, the first time through."

5 MR. BRUSCHI: We're fully prepared and  
6 expect a very thorough review.

7 CHAIRMAN SELIN: I don't think a system  
8 has ever gotten the thoroughness of a review so  
9 early -- I know it doesn't feel early, but,  
10 nevertheless, so early in the cycle as this system has  
11 come. That's really terrific.

12 Thank you very much.

13 MR. BRUSCHI: You're welcome.

14 (Whereupon, at 11:33 a.m., the above-  
15 entitled matter was adjourned.)

16

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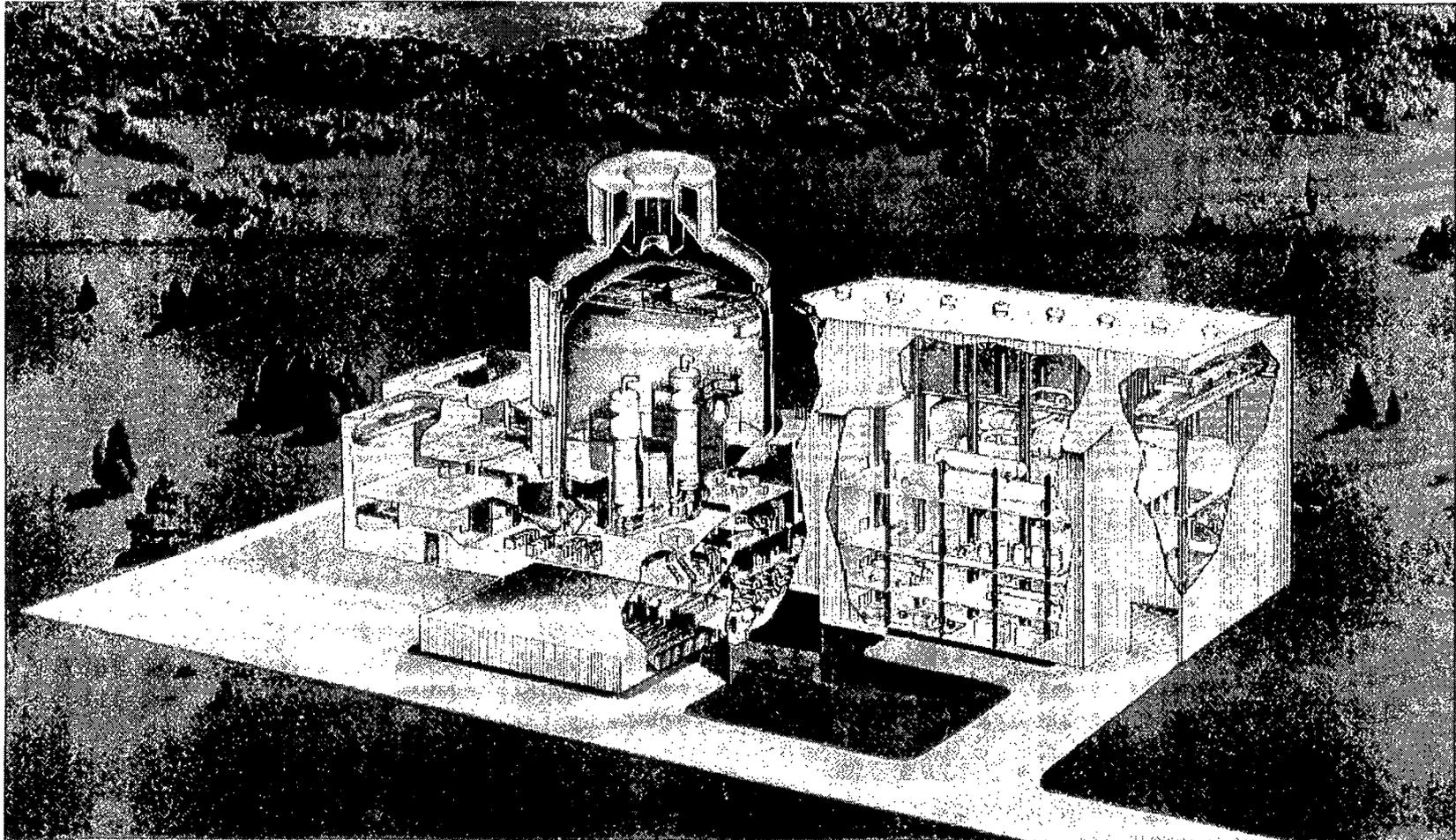


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**AP600 Design Certification Status**

Westinghouse Electric Corporation

April 7, 1994





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# **AP600 DESIGN CERTIFICATION STATUS**

## **INTRODUCTION**

**HOWARD J. BRUSCHI  
GENERAL MANAGER, ADVANCED TECHNOLOGY  
WESTINGHOUSE ELECTRIC CORPORATION**

# **INTRODUCTION**

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**Significant progress has been made towards AP600 Design Certification**

- **SSAR/PRA Submitted - June 1992**
- **ITAAC Submitted - December 1992**
- **NRC review well underway**
- **Focus has been on testing**
  - **Testing program closure with staff near**
- **AP600 RTNSS implementation submitted - September 1993**

# **INTRODUCTION**

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**Westinghouse is committed to the AP600**

- **AP600 Design certification project team assigned**
- **Detailed scheduling process implemented**
- **AP600 FOAKE contract awarded**
- **Foreign participation increased**
- **Last briefing March 1992**
  - **Committed to integral systems test in SPES**
  - **First test - February 5, 1994**



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# **AP600 DESIGN CERTIFICATION STATUS**

## **AP600 TEST PROGRAMS**

**L. E. HOCHREITER  
CONSULTING ENGINEER, NUCLEAR TECHNOLOGY DIVISION  
WESTINGHOUSE ELECTRIC CORPORATION**

# **AP600 TEST PROGRAMS**

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**In structuring the AP600 test programs, Westinghouse considered:**

- **What systems are different?**
- **What design information is needed?**
- **What phenomena are important?**
- **Which codes or models should we use?**
- **What data are needed for code/model validation?**

# AP600 TEST PROGRAMS

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This thought process led us to perform:

- **Scaled and full-scale tests of critical components**
  - Core Makeup Tank Tests
  - Passive RHR Heat Exchanger Tests
  - Automatic Depressurization System Tests
  - Containment Water Distribution Tests
  - Wind Tunnel Tests
  
- **AP600 integral systems tests**
  - SPES-2, full height, full pressure
  - OSU, 1/4 height, low pressure
  - SST, small scale integral containment
  - LST, 1/8 scale integral containment
  
- **Best-estimate thermal-hydraulic analysis**

# **AP600 TEST PROGRAMS**

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## **Frequent and Detailed Interactions with NRC staff**

- **Meetings have been held on each test program (facility design reviews, test matrix reviews, test results)**
- **Responses have been provided to Staff Requests for Additional Information (RAI's)**
- **Weekly phone calls on test program schedules and status**
- **Hundreds of test program documents forwarded to NRC staff**
- **NRC staff have visited test sites to witness test preparations and operations**

# **AP600 TEST PROGRAMS**

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**These interactions have been positive**

- **Suggestions of NRC staff and consultants have been integrated into the test program**
- **Issues are identified and actions are taken to reach resolution**
- **NRC letter dated 11/4/93 identified AP600 test program issues**
  - **Meeting on 12/10/93 to discuss and clarify issues**
  - **Issues further discussed at meetings on 1/25, 2/22, 2/23, 2/24, 3/14 and 3/17**
  - **Meeting scheduled for 4/7/94 to close out remaining items**

# **AP600 TEST PROGRAMS**

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**The ACRS has been involved from the onset of the test program**

- **Several meetings have been held on specific test programs**
- **ACRS staff and/or consultants have visited SPES-2, OSU, CMT, and containment test sites**
- **Presentations have been made to T/H Phenomena Subcommittee, Advanced Plant Subcommittee and Full Committee**

# AP600 TEST PROGRAMS



**Point of difference with ACRS has been test facility scaling**

- **T/H Phenomena Subcommittee and consultants would like to see detailed scaling basis for most tests**
- **Westinghouse has performed such analyses for those tests for which scaling is judged to be important**
  - OSU - very detailed effort, ACRS concurs
  - SPES-2 - test design requires limited effort
  - CMT - effort similar to OSU; ACRS would like more detailed effort
  - Cont. - effort directed toward code models, ACRS would like more detailed effort
- **Additional scaling efforts are underway, but only in areas where it will help with code validation**

# **AP600 TEST PROGRAMS**

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**ACRS interactions have contributed to the maturation of the test programs**

- **ACRS members and consultants have participated in meetings with NRC staff**
- **Comments during the meetings and written reports have provided valuable guidance**
- **Several suggestions have been incorporated into the test programs**

# **AP600 TEST PROGRAMS**

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**The AP600 test programs have been underway since 1988**

- **Results from completed tests were integrated into the SSAR analyses, e.g.,**
  - **Small scale containment system tests**
  - **Baseline large scale containment tests**
  - **Passive residual heat removal tests**
  - **High inertia reactor coolant pump bearing test**
  
- **These tests support SSAR conclusions and margin identified for passive safety system design**

# **AP600 TEST PROGRAMS**

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**SPES-2, Full Height Full Pressure Integral Systems Tests are underway**

- **First matrix test, a 2 inch cold leg break, was completed on 2/5/92**
- **Facility operated well and results met or exceeded expectations**
- **Repairs to two power-channel gaskets have delayed subsequent tests**
- **All repairs have been completed; the next matrix is scheduled for 4/9/94**

# **AP600 TEST PROGRAMS**

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**OSU, 1/4 Height Low Pressure Integral Systems Test Facility is undergoing pre-operational testing**

- **Construction activities are complete with the exception of the break valves and associated break piping**
- **Cold pre-operational tests are underway; volume and resistance checks have been completed**
- **Hot functional tests are scheduled to begin on 4/10/94**
- **Matrix tests are scheduled to begin on 6/30/94**

# **AP600 TEST PROGRAMS**

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## **Automatic Depressurization System (Phase B) test facility construction underway**

- **All valves have been delivered to the test site**
- **Construction activities are underway; fabrication of the valve piping package is nearing completion**
- **Facility commissioning tests are scheduled to begin 6/21/94**
- **Matrix testing to be completed by 10/28/94**

# **AP600 TEST PROGRAMS**

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## **Core Makeup Tank Tests are underway**

- **As a result of the hot pre-op testing, an inlet steam distributor was installed to reduce rapid steam/water condensation**
- **Facility modifications to improve operations were completed in January, 1994**
- **Additional instrumentation has been installed**
- **Three matrix tests have been completed**

# **AP600 TEST PROGRAMS**

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**Passive Containment Cooling System (PCCS) test data is being analyzed**

- **All PCCS tests have been completed**
  - **Large 1/8 Scale Heat Transfer Tests**
  - **Water Distribution Tests**
  - **Wind Tunnel Tests**
- **A blind Large Scale Heat Transfer test was performed at the request of the NRC staff**
- **Test data have been transmitted to NRC via "quick look" reports to facilitate test data review and analysis**

# **AP600 TEST PROGRAMS**

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## **Departure from Nucleate Boiling (DNBR) Test are completed**

- **Tests performed to obtain DNB data at low flow conditions**
- **All DNBR tests were completed in 2/94**
- **Three rod bundle configurations were tested**

# **AP600 TEST PROGRAMS**

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## **Summary**

- **The AP600 test program is a detailed, well developed program**
- **The test program is designed to provide Westinghouse and NRC with the information necessary to support code validation for design certification**
- **The program has benefitted from NRC and ACRS review**
- **The few remaining open issues are receiving close management attention to bring to full closure**



# **AP600 DESIGN CERTIFICATION SCHEDULE**

**ROBERT M. VIJUK  
MANAGER, AP600 DESIGN CERTIFICATION PROJECT**

# **AP600 DESIGN CERTIFICATION SCHEDULE**



**Original intent was to complete all tests by December 1993**

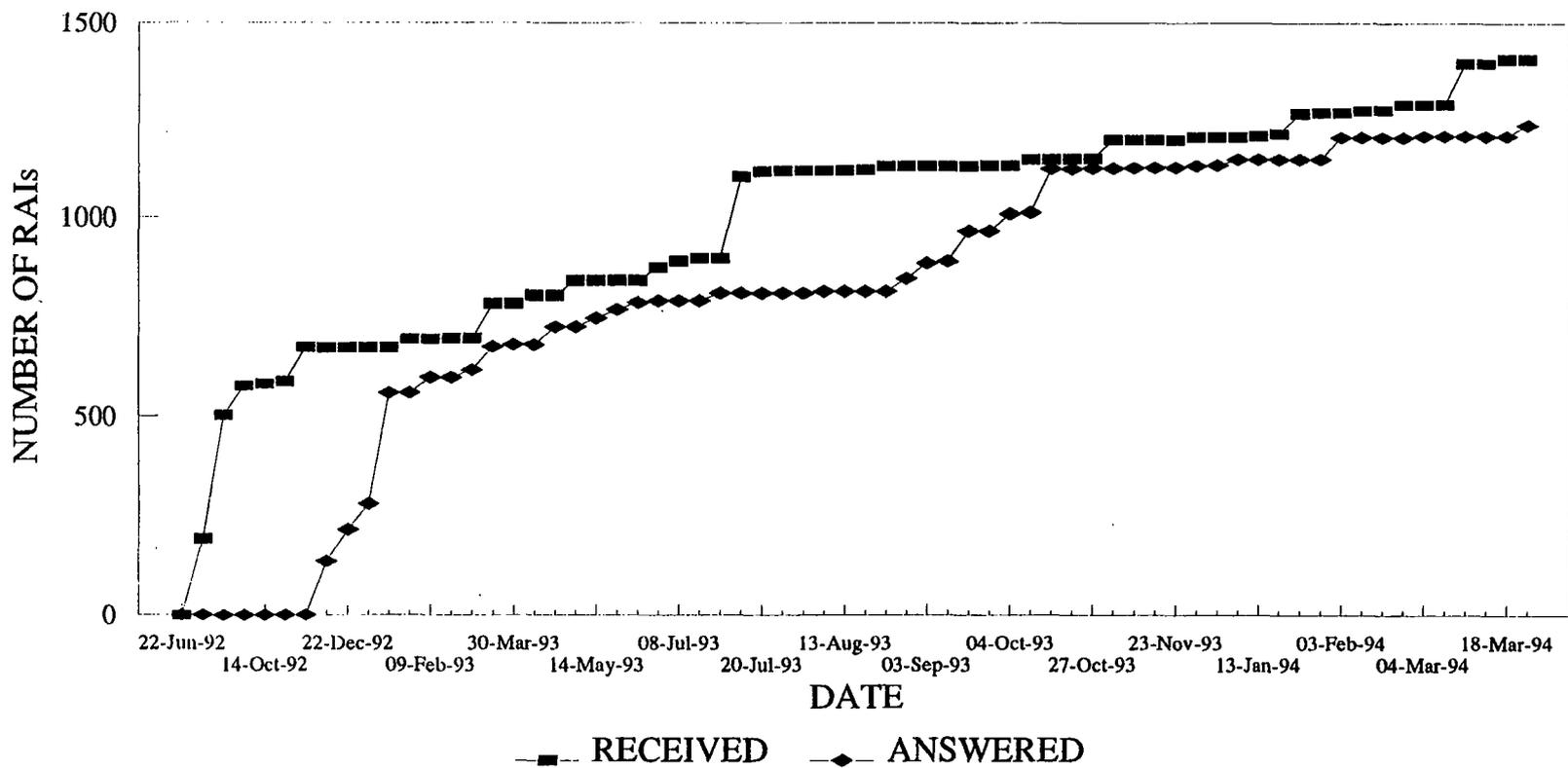
- **Testing schedules slipped**
  - **Increased scope of program**
  - **Addressed points raised during staff review**
  
- **Detailed schedules developed that include:**
  - **Results of test facility readiness assessments**
  - **Discrete logic between related activities**
  - **Results optimized testing order**
  - **Code development activities**
  - **Intermediate deliverables to NRC**
  - **Timing of staff feedback**
  - **Single DSER - December 1994**
  - **FDA - June 1996**
  
- **Formally transmitted to NRC March 29, 1994**

## **3/14/94 SENIOR MANAGEMENT MTG**

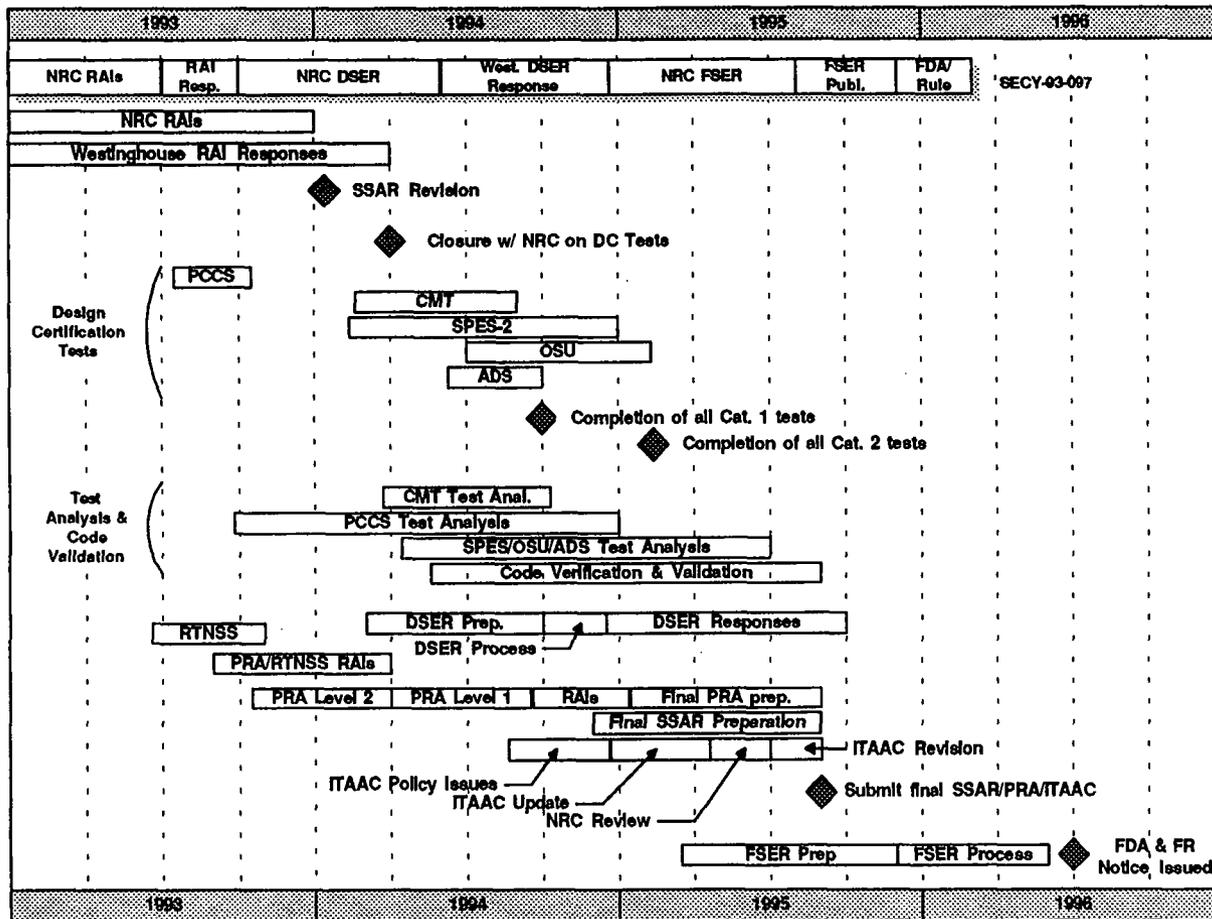


- **Working to single DSER schedule**
- **Cutoff dates for DSER input established**
  - **June 30, 1994 - Nontesting DSER input cutoff**
  - **July 31, 1994 - Testing DSER input cutoff**
- **NRC AP600 Review schedule looks to be "within a month" of the Westinghouse schedule**

# REQUESTS FOR ADDITIONAL INFORMATION



# AP600 DESIGN CERTIFICATION SCHEDULE



# **AP600 DESIGN CERTIFICATION SUBMITTALS**



- **SSAR Update - January 13, 1994**
  - **RAI response incorporation**
  
- **PRA Update**
  - **RAI response incorporation**
  - **Level 2 requantification**
  
- **RAI Responses**
  - **Meeting 90 day turnaround**



# **AP600 TECHNICAL AREAS**

**BRIAN A. McINTYRE**

**ADVANCED PLANT SAFETY AND LICENSING**

# **USE OF PRA IN DESIGN**

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**PRA has been an integral part of design process**

- **Identification of areas of improvement**
  - **Success criteria changes**
  - **Operation changes**
  - **Design changes**
- **Severe accident insights**

# RTNSS

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## Regulatory Treatment of Non-Safety Systems is the most important AP600 issue

- **NRC/Industry agreement reached May 20, 1993**
- **AP600 Implementation submitted September 24, 1993**
  - **No systems captured through PRA**
  - **2 systems from deterministic events**
  - **5 systems from shutdown initiating events**
  - **1 system included to provide operational flexibility**
- **Regulatory oversight proposed**

# **RTNSS**

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- **NRC Senior management presentation - October 26, 1993**
- **NRC staff presentation - November 8, 1993**
- **Level 1 PRA review**
- **Next action to work out details on a specific system**

# **AP600 PRA REVIEW**

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- **271 RAIs received**
- **Excellent working meeting with staff - February 15, 1994**
- **No show stopping issues identified**
- **Meeting to discuss INEL RAIs - April 1994**
- **Review essential to support RTNSS resolution**

# **TEST PROGRAM QUALITY ASSURANCE**



- **The Quality Assurance program applied to the AP600 tests meets applicable requirements**
  - **10 CFR Part 50, Appendix B**
  - **NQA-1**
  
- **Applied to all parts of program**
  - **Test Design**
  - **Test Procedures**
  - **Test Operations**
  - **Data Reduction and Reports**
  - **Data Analysis**
  
- **The result is high quality data for computer code validation**

# **CONCLUSIONS**

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- **Significant progress made in schedule development**
  - **NRC "within a month" of Westinghouse**
  
- **Testing program**
  - **Well underway**
  - **Near closure with NRC**
  
- **Continued management attention essential to assure success**