UNITED STATES NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

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AP1000 SUBCOMMITTEE

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FRIDAY

JULY 24, 2009

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The Subcommittee convened at 8:30 a.m. room T2-B3 at Nuclear Regulator Commission Headquarters 11545 Rockville Pike, Rockville, Maryland, Harold B. Ray, Chair, presiding.

SUBCOMMITTEE MEMBERS PRESENT:

HAROLD B. RAY, Chair

SANJOY BANERJEE

SAID ABDEL-KHALIK

CHARLES H. BROWN, JR.

CONSULTANTS TO THE SUBCOMMITTEE PRESENT:

THOMAS S. KRESS

NRC STAFF PRESENT:

MICHAEL LEE, Designated Federal Official

DAVE JAFFE

MANNY COMAR

JAMES GASLEVIC

JERRY WILSON

NICK SALTOS

GREG GALLETTI

JUAN PERALTA

STEPHANIE COFFIN

MALCOLM PATTERSON

SERITA SANDERS

BRIAN THOMAS

FRED FORSATY

GENE HSII

RAVI JOSHI

NEIL RAY

S.K. MITRA

T.R. TJADER

ALSO PRESENT:

JOHN DEBLASIO

MARK WILLIAMS

ED CUMMINS

TOM RAY

TOM SPINK

EDDIE GRANT

CHUCK BROCKOFF

ROB SISK

ANDREA STERDIS

RICK ANDERSON

BOB FETTERMAN

DALE WISEMAN

SUMIT RAY

DON BEHNKE

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

8:31 a.m.

CHAIRMAN RAY: We will come to order, please, and go on the record. Indulge me as I provide this opening announcement, please. This is the second day of the meeting of the AP1000 Reactor Subcommittee, a standing subcommittee of the Advisory Committee on Reactor Safeguards, ACRS. I'm Harold Ray, Chairman of the subcommittee. Other ACRS members in attendance are Said Abdel-Khalik, Sanjoy Banerjee, Charles Brown, Jr.

Tom Kress, an emeritus of the ACRS and former committee chairman, is also seated here at the table with us today and he is an invited consultant to this subcommittee. Mike Lee of the ACRS staff is the Designated Federal Official for this meeting.

The purpose of this two-day subcommittee is to commence with reviews and discussions concerning Revision 17, the design control document of DCD describing the standard plant design for the AP1000 pressurized water reactor. In parallel to the DCD certification review the staff are also in the process of reviewing a combined operating license application, COLA, for two AP1000 type of reactors at the former Bellefonte reactor site in Jackson County, Alabama.

Today the subcommittee will hear from the staff and the results of their DCD review as well as the results of their R-COLA reviews, R-COLA designating Bellefonte as the reference COL.

In summary, this subcommittee intends to gather information, analyze relevant issues and facts, and formulate proposed positions and actions as appropriate from this meeting for deliberation by the full committee of the ACRS at a later date.

We may also determine that additional meetings of one or more of the items discussed over the next few days merits additional study by this subcommittee.

The rules for participation in today's meeting have been announced as part of the notice of this meeting previously published in the Federal Register. I believe we have received no written comments or requests for time to make oral statements from interested members of the public regarding the subject of today's meeting.

I understand that we have a speaker phone in operation today again. We ask that those individuals participating in the subcommittee meeting over the telephone bridge lines place their speaker phones on mute.

As stated in our earlier Federal Register

notice, a transcript of this meeting is being prepared and will be made publicly available in the near future on the ACRS website. Therefore, we request that anyone wishing to address the subcommittee on the record use one of the microphones located throughout the meeting room and request you first to identify yourself and your affiliation and speak with sufficient clarity and volume so that your comments may be readily heard and recorded.

We also request that if you are in possession of cell phones or some other type of electronic paging device, adjust it to silent mode or turn it off so it will not disturb the conduct of the meeting. Thank you.

Now, before we begin with today's agenda, which my colleague will help me since I don't have it in front of me -- oh, it's in orange nowadays. There you go. Anyway, we'll begin with Chapter 14 which is on the screen already momentarily. I wanted to go back to an item from yesterday. Our staff has brought to my attention a letter dated July 22 from the ACRS to Mr. Borchardt, the EDO, which pertains to something that was discussed yesterday as part of the staff's presentation of Chapter 12, their review of Chapter 12.

This is for the purpose of just alerting people. It's not intended that there be any discussion of this matter now but the NEI templates, which were identified on slide 11 of their presentation, refers to, among other things, NEI 08-08. That is the generic FSAR template guidance for life cycle minimization of contamination and draft Design Certification COL interim staff guidance.

Anyway, this letter that I'm referring to just issued does include a recommendation that NEI 08-08 should not be endorsed and ISG-06 should not be issued until a satisfactory definition of the words radiologically significant was developed and the reasons for that recommendation are provided in the discussion portion of the letter which, of course, will be available to everyone. This has been signed out by the Chairman of the ACRS.

So that is a footnote or comment on the part of the subcommittee today on this one reference in the staff presentation yesterday and is intended just to make everyone aware that there is this recommendation outstanding from the ACRS.

Now, with that, and with my agenda before me, we are ready to begin, resume actually, our work with Chapter 14. I'm looking for Rob but he's not

there. You are going to take the lead. Go ahead.

MR. DEBLASIO: Yes, good morning. I'm John Deblasio from Westinghouse. I'm going to discuss Chapter 14 and my two subject matter experts are Mark Williams and Tom Ray. Chapter 14 basically is initial test programs and it is broken up into basically four categories in Chapter 14 specific information to be included in either the PSA or the FSA or pre-op tests, certified design material, and combined licensee applicant responsibilities which would include organization and staffing, test specifications and procedures, conduct of test programs, review and evaluations and interface requirements.

The major changes for this chapter were basically two combined license holder items. One was information in 14.4-3 which was conduct of test programs. Westinghouse developed a report TR-71B which was entitled Startup Administration Manual and it was to support closing the COL holder item. The second one was Section 14.4-2 which was test specifications and procedures. It was also designed to support the COLA holder item.

Third item was proposed response to the "as-built" definition. For TR-71A this was generated. This specifically addressed 14.4-2. This report was

entitled AP1000 Test Specs and Procedures. The purpose of the document was to close the holder item. The second one was 14.4-3 we generated TR-71B which was entitled Conduct of Test Program. Purpose of the document was also to support the COLA holder item.

Both of these were discussed with the staff. They were identified as open items. The resolution to those two items which were agreed upon with the staff was that Westinghouse would remove those two references, both 71A and 71B, restore the language in the DCD to Rev. 16 versus the revised language in Rev. 17.

Revised markups for the DCD were also provided to the staff to review to make sure that they were in concurrence. Got concurrence from the staff. As far as Westinghouse is concerned those two items are closed based on discussions with the staff and a letter drafted up. The remaining item was the "as-built" definition.

CHAIRMAN RAY: Okay, wait. Before you go on, okay, that seems like that's history that maybe we could leave. Could you just give us a little more briefly illumination on what was at stake here from your standpoint?

MR. DEBLASIO: I will defer to Mark

Williams. Mark drafted up the two reports.

MR. WILLIAMS: Good morning. My name is Mark Williams and I'm with Westinghouse. In regards to the two technical reports which were submitted, one which addressed COL information item 14.4-2 entitled Test Specifications and Procedures. The revision of the technical report that was transmitted to the NRC delineated all of the programmatic interfaces involved with the development of the test specifications and the test procedures, pre-operational and startup test specifications and test procedures.

In fact, we have developed the test specifications and the remainder of the material is in the process of being development. Essentially the staff indicated that this item should not be closed until all of the test specifications and test procedures were available for review by the staff.

The second technical report which is TR-71B entitled AP1000 Conduct of Test Program actually contained a document which was entitled AP1000 Startup Site Administrative Manual Program Management Description and it contained a description and some of the details of the information that would be involved in the specific site startup administrative manual absent these site specific details.

It was determined that the staff wished to have those details provided by the COL holder. Therefore, that led to our request to delete reference to this report in the DCB and to restore the language in the DCB to Chapter 15 or the designed certified version.

The same action was requested for the report entitled AP1000 Test Specifications and Procedures references that document which will be in lieu of the initial COL information which in both cases states that the combined operating license applicant or holder is responsible for providing this information to the NRC.

CHAIRMAN RAY: Well, I could maybe try and figure out what that all boils down to but, Ed, do you want to --

MR. CUMMINS: Yes, I would be happy to. Ed Cummins. I think all of this is a decision about where in the regulatory approval process you deal with these topics. Westinghouse thought that this could be standardized and it could be certified, at least to the extent of work that we've done which was to test out lines and procedures.

The staff felt that unless you have done all of the work there, including develop the

procedures, that it's not appropriate to put in the certified design that should be in the COL application. All of this is a discussion of where in the regulatory process, Design Cert or COL, should this belong. We didn't really care so we agreed with the staff that said if you want to put it in the COL we'll help our COL folks submit similar reports to the ones we already did.

CHAIRMAN RAY: All right. It would help us all if a simple explanation like that could precede the recitation of process that isn't really what we're interested in. This is a simple matter of doing as Ed said. Maybe he's over-simplified it but, in any event --

MR. CUMMINS: Not intentionally.

CHAIRMAN RAY: In any event, it is welcomed by us if somebody would just say simply this is information that is being moved from where Westinghouse thought it might go to another place, the COL specifically. We can dispense with a lot of trying to figure out what on earth are you talking about.

Okay. Go ahead.

MR. DEBLASIO: In the spirit of simplification, the last open item was the revised

definition of "as-built" and the basic issue was we have adopted the language from NEI 08-01 and the staff preferred we reclassify it to Tier 1 which would require an exemption to the rule.

We are currently under discussions with the staff in conduct conclusion to close this open item. Westinghouse prefers we reclassify it to Tier 1 star which would still require some NRC approvals prior to us doing anything with it. We haven't come to convergence yet.

CHAIRMAN RAY: Okay. One always imagines that there is some reason for the lack of convergence, as you say. Perhaps we'll ask the staff their perspective on that but if you want to comment further.

MR. DEBLASIO: Tom.

MR. RAY: Tom Ray from Westinghouse. This issue is the same issue that was brought up with Reg. Guide 1.215. In our Tier 1 we have put the NEI 08-01 definition purely in. Then the supporting information that is included in secondary sections of NEI 08-01, that is the information that we believe should be in Tier 2 star. The reason is for words like impractical.

The word impractical is put in that

secondary information. Our concern is what may be impractical now or to a certain individual may not be impractical later on. There are a lot of issues with the secondary information and we are handling this. NEI is also handling this on the industry front, too.

CHAIRMAN RAY: All right. Good. That is clear and helpful. Thank you.

MEMBER BROWN: You say secondary information. I didn't understand that term.

MR. RAY: The secondary information in the supporting section basically goes on and talks a little bit further about if you are going to perform ITAAC work at a vendor, it has to be performed at the vendor if it's impractical to perform it onsite.

In concept, if we are going to perform as much of the ITAAC work onsite as practical, the problem is your definition of practical five years from now, 10 years from now, 15 years from now, I mean, if you had planned to do something at the vendor like a simple measurement that you could do with calipers or tape and later on, you know, it's just the definition of impractical.

MEMBER BROWN: It's timing.

MR. RAY: Yes.

MR. CUMMINS: This is Ed Cummins again.

This may be a little clearer. Because of 10 CFR 52 way back 10 or 15 years ago the staff and the industry agreed that if you want to explain something about ITAAC that you didn't want in Tier 1, you use Section 14.3 for this. It's kind of a unique section. Here everybody agrees we need to define "as-built" and we are just deciding how we put it in 14.3. What words and if future staff review will have changes to the words.

CHAIRMAN RAY: All right. This can seem arcane to many but it does have real significance in many cases. Thank you. Go ahead.

MR. DEBLASIO: So basically in summary we had three open items on Chapter 14. Two of them were the COLA placeholder items and we think we came to convergence. We haven't gotten consensus from the staff yet. The third one is the "as-built" definition which we are working to consensus.

CHAIRMAN RAY: All right. Any other questions or comments? Thank you.

MR. SPINK: Good morning. I'm Tom Spink from TVA and I have Bob Hermanpour if needed, the contact for the COLA in Chapter 14 as listed. As you are probably well aware by now, an awful lot of this is incorporated by reference and/or standard. In

developing our information we submittal we used the guidance of Reg. Guide 1.68, 1.206, and 1.16. 1.68 is initial test program and 1.16 is reporting of operational information for test reports.

There were several COLA items that we needed to address. The first one was organization and staffing. We needed to provide a definition of the licensee's organization. This was a standard part of the submittal where we laid out a generic for the industry for the applicant's test organization structure and staffing.

The second one dealt with test specification and procedures. This was related to what we heard earlier in terms of going from the DCD to the COLA. We proposed a licensed condition to provide a schedule for developing this information after the COL is issued.

COLA Item 14.4-3, Conduct of Test Program, again was related to what we heard earlier. We brought that standard information into the COLA. In addition, we provided a licensed condition for administrative controls for the development of startup administration manual and changes to initial test program that addresses how changes to the initial test program are controlled and reported to NRC.

COLA Item 14.4-4, again a standard part of the submittal, dealt with review and evaluation of test results. Again, this was a post-COL licensed condition that was proposed to be provided after COL.

The topics or the subject for this is to provide controls for reviewing test data, evaluating test results, verifying acceptance criteria, that those are met, verifying that test results that do not meet acceptance criteria are entered into the Corrective Action Program, and verifying that the results of the retesting do not validate ITAAC results.

There is a COLA item as well on interface requirements and these interfaces are things that are not within the standard plant scope. For these we provided test abstracts for balance of plant systems essentially, storm drains, off-site AC power, raw water system, sanitary drains, fire brigade, support equipment, portable radiation monitors, and the cooling towers.

The last COLA item dealt with first-plant-only and three-plant-only tests. Again, this is a post-COLA item. Licensed condition was proposed that basically says these tests will be done. Right now we don't know what the first plan is or what the first

three plans are going to be to conduct these tests yet but the bottom line is wherever and whenever these tests will be done information will be provided to the staff.

CONSULTANT KRESS: It's the only part of that that bothers me. The purpose of these tests partly is to be sure the equipment functions as you thought it would but also be sure there are no screw-ups. I don't see how you can take the results of only three plants or only one plant and extrapolate that to another plant that doesn't have to undergo this test. It bothers me a little, the concept. Is there an option to not do it after the third one or after one?

MR. SPINK: This doesn't obviate the need for a good thorough and complete initial plant test program. This is for -- Mark, you may want to jump in here but this is for other systems and equipment that I think are more significant or unique.

MR. CUMMINS: This is Ed Cummins again. This is part of the certified design. We, the staff, and Westinghouse looked at the test program and there were certain tests that I will say are challenging to the plant. Like in the old days like the natural circulation tests we have tests of the ADS that put loads on tanks and cause issues.

There is a small number of these tests, three to five. We decided that we had to demonstrate, the staff decided mostly, that there was a requirement to test those things. If they didn't really rely on how you installed or built the plant as much as they did on demonstrating, that the AP1000 was designed correctly. We decided collectively to have a subset of the tests that are challenging to the plant, the three plant only or some that are one plant only. One plant only, for example, is internal vibration. You need to do it once so that's where we are.

CONSULTANT KRESS: These subsets are spelled out somewhere?

MR. CUMMINS: Yes. They are in Chapter 14. Chapter 14 sort of describes the test program. When you come to one of these it says three plant only or one plant only.

CONSULTANT KRESS: That makes a big difference.

MR. WILLIAMS: This is Mark Williams from Westinghouse. These are dominated in 14.2-5 of the DCD.

CHAIRMAN RAY: Okay.

MR. SPINK: Okay. We have a couple of other standard supplements that we provided, one

related to schedule information and that is a commitment that the site specific initial test program will be provided to the NRC after COL issuance.

There is a process that after the COL the licensee communicates with the staff what our construction schedule is, what our ITAAC schedules are, what are test programs are, etc. 14.3 standard supplement addresses additional site specific ITAAC. In this case we proposed ITAAC for emergency planning and a physical security plan. We have two open items that deal with two of the proposed licensed conditions. It's our understanding that these are really related back to that Chapter 1 open item that relates to really what is appropriate for a licensed condition as opposed to FSAR commitments. That concludes my remarks.

CHAIRMAN RAY: Okay. Any further questions of the applicant? David.

MR. JAFFE: Good morning. My name is Dave Jaffe. I'm the Lead Project Manager for the staff's evaluation of the AP1000 Design Certification Amendment. In addition, I'm Chapter Project Manager for Chapter 14. I report to Eileen McKenna who is Chief of the AP1000 Licensing Branch 2.

With us today is Manny Comar who is going

to address the staff's evaluation of the applicant under the COL Chapter 14. From the technical staff, Juan Peralta who is Chief of the Quality and Vendor Branch 1; James Gaslevic who will be addressing 14.3; and Greg Galletti who will be addressing the remainder of Chapter 14. The lead reviewer, by the way, was Milton Concepcion who is not with us today.

Here you see the AP1000 Design Certification Amendment under open items on the left. Westinghouse has already addressed the open items but just for completeness, we might say that in 14.3 that one open item has to do with definition of "as-built". In 14.4 there were two items, one having to do with the startup administrative manual. The other one had to do with test specifications and procedures.

Manny Comar will now address Bellefonte.

MR. COMAR: I'm going to --

MR. JAFFE: Did you want to talk about the open items on Bellefonte?

MR. COMAR: Yes. I'll switch back and forth on the slide. I'll take you to slide 7. Good morning. My name is Manny Comar. I'm the Project Manager for Chapter 14 for Bellefonte. I work for Stephanie Coffin who has already spoken to you yesterday.

CHAIRMAN RAY: Yes.

MR. COMAR: And I will talk about Section 14.3 related to the site specific ITAAC.

Bellefonte has proposed two supplements basically, a standard supplement which is the 14.3-1 which deals with the selection methodology and section criteria for screening in ITAAC which is identical to the DCD. Under that I think the staff has accepted that as part of the DCD so that is acceptable as part of the Bellefonte selection.

In addition to that there are two ITAACs which are emergency planning and physical security ITAACs which are site specific and they are being discussed in this section. In addition to that the staff was able to identify one additional site specific ITAAC related to the off-site power.

CHAIRMAN RAY: What?

MR. COMAR: Off-site power.

CHAIRMAN RAY: Off-site power. Okay.

MR. COMAR: I'm not going to talk about any of those here because emergency planning and physical security ITAACs will be talked about in Chapter 13 and the off-site power will be discussed under Chapter 8. When the staff comes to make your briefing on those two chapters, that is when they will

talk about it. That's basically --

MR. JAFFE: The staff would like to start with discussion of 14.3 in order to make the remainder of Chapter 14 have better continuity unless there is any objection.

In the FSER associated with the AP1000 Design Certification NUREG-1793. In 14.3 the staff considered the full breadth of Tier 1 information. In Supplement 2 to the FSER which is currently under preparation, you changed our approach somewhat with regards to the Tier 1 information in that we felt it was more appropriate to address it along with the appropriate Tier 2 information.

For example, the instrument ITAAC would be discussed in Chapter 7. However, there was one important issue that remained in 14.3 for the Design Certification Amendment that is worth consideration here and that is with regard to the definition of "as-built".

The reason it's of interest is it affects a large number of ITAAC. In the definition of as built there was the expectation that ITAAC would be-closed out after final installation and the reason was that following manufacturer transportation, other types of handling and installation, there was a

possibility that the properties of the component might be changed in such a way that it was important that the ITAAC identify those problems after installation.

Westinghouse in order to accommodate modular construction and other types of considerations found a need to have additional flexibility in this area such that under certain conditions ITAAC might be closed out at the vendor site.

James Gaslevic will now address the change to the definition of "as-built".

MR. GASLEVIC: Good morning. Jim Gaslevic, NRO Division of Construction and Inspection. On July 7th staff presented Reg. Guide 1.215. In there we discussed some clarification that is in the NEI guide that we recommend be included in future uses of the definition of "as-built", design certifications particularly.

Slide 3. Staff identifies that it might be impractical to perform some inspections for ITAAC before final SSC installation in its "as-built" location. For example, maybe interior dimensions of a valve or something like this where it might be a little more or it might be more practical to perform those inspections at a vendor location.

The current definition of "as-built" in

08-01 includes this sentence. "A determination of physical properties of the "as-built" structure system component may be based on measurements, inspections, or tests that occur prior to installation provide the subsequent fabrication, handling, installation and testing do not alter the properties," like Dave mentioned.

The clarification that is also included in Section 3.1.4 of 08-01 places a restraint on a licensee or someone using these inspections to satisfy ITAAC, to limit those inspections to whenever it's impractical.

Staff feels that with the definition currently in 08-01 it leaves it more open-ended. It leaves it more to the discretion of the licensee when they can take advantage or could take advantage of using vendor location, inspections, and tests to satisfy ITAAC where staff's opinion is that it should be limited to only when it's impractical. Therefore, -- next slide, please.

Therefore, staff believes that the clarification that is in 3.1.4, the language how this should be limited to only when it's impractical should be included in the Tier 1 information in the definition of "as-built".

CHAIRMAN RAY: Well, all right. This fairly understandable desire to nail down what is going to be impractical in the future, on the one hand, and, on the other hand, the difficulty of doing that at this point in time remains unresolved. I'm not sure that the ACRS has anything to offer on that frankly. If there are any questions about the issue, I invite members to --

MEMBER BANERJEE: So the safety injection lines, are these going to be part of the "as-built" definition or are they going to be detailed?

CHAIRMAN RAY: If I could interrupt before somebody answers. By the safety injection lines if we are talking about the safety injection lines at a vendor location versus in the plant, for example, if you had a module constructed at a vendor location with the safely injection line?

MEMBER BANERJEE: I meant, let's say, the DVI. Is it all speced out and detailed?

MR. CUMMINS: It is. In fact, the staff has reviewed a piping analysis of it and leak before break analysis of it. I think the question in hand is if you made that at a module in a module shop, you could do the measurements on it like length.

You would have a problem only if you did

something that changed it on the way from the module shop to the site. The whole definition of impractical is -- impractical is a hard word because everybody has their own view of it so it's not a good word to have in Tier 1. That's one problem.

The other comment is maybe kind of a more general one. The staff wants the thing to be "as-built" for two reasons. One, I believe, is so you make sure that you are really looking at the thing that got installed and it didn't get sent to some other site, for example.

The second is that it's probably easier for them to inspect at the site than some other place. That needs to be balanced in the end with the time that ITAAC occurred in the construction process.

What we are finding is that the more you push it to have to be installed, the ITAAC gets approved or gets complete later and later in the process so it pushes the review process of ITAAC back towards the end of the project and challenges everybody, the staff and applicant, related to the amount of work and the workflow. That is the kind of discussion that is going on. I would agree it's really a project management discussion more than it is a technical issue.

MR. WILSON: This is Jerry Wilson, NRO. I would like to add on to Ed's comments a couple of points here I think is important to remember is that when we created -- when I say "we" I mean in this particular case Westinghouse proposed and the staff reviewed but I'm going to speak to all four of the original design certifications because I was involved in the development of those ITAAC.

The understanding and expectation was that the "as-built" verification was going to be in the final in-place location. Understand our goal here. This is ITAAC verification and the purpose of ITAAC is to verify that the as-installed equipment is in conformance with the approved design and the other phrase in ITAAC is that it will operate in accordance with what was stated in the application. That is why that verification and the final location is important. Plus it was the understanding we all had at the time we were creating the ITAAC.

Now, after the fact, after all the ITAAC are created, now NEI came forward and said, "Well, there are these certain situations where it's impractical." Will you agree with that? They are very limited and that is important to keep in mind so in those limited situations we agreed that they could

modify the definition provided that restriction was placed on it.

CHAIRMAN RAY: Okay. Do you have any concern about the applicant's point that you're pushing a valve wave of ITAAC out in time. In other words, things that could be done earlier are not being done because it's practical also to do them on this plant site which you can't prove its impractical. The result of that is going to be a big accumulation of ITAAC that could have been done sooner but are put off just because you can do them at the site. Is that of any concern?

MR. WILSON: The fact is that most of the ITAAC are going to be verified late in the game. It's not because so much of this "as-built" definition but rather the way the ITAAC were organized the industry chose to do it that way. The ITAAC organize structures and systems. As you know, the systems get completed late in the game and that is why they are back-end loaded. That was industry's choice and this is just a consequence of what happened.

CHAIRMAN RAY: It's not due to this issue.

MR. WILSON: I think that's a major point here.

CHAIRMAN RAY: Well, all right. As I

said, I'm not sure. It's illuminating for us perhaps. Maybe we have some insight to bring to it but at this point I'm skeptical.

MR. JAFFE: I think it's worth noting -- oh, this is Dave Jaffe. I think it's worth noting, though, that the applicant and the staff have consensus on the definition of "as-built" and the clarification. Now, the clarification to that definition is the part that provides the amount of flexibility that is desirable.

What we are discussing at this point is just where that clarification should be addressed. The staff feels that it is more or less part and parcel of the definition and, therefore, it really should be as a footnote or as part of the definition itself.

CHAIRMAN RAY: I think, David, the discussion we've had here indicates there is more to it than simply an editorial element of where it should be addressed and should there be a footnote or whatnot. It does seem like there is tension in terms of what people perceive to be best practice.

MR. JAFFE: Well, certainly, there is more. I agree. We need to basically come to a final understanding.

CHAIRMAN RAY: Sure. Understood. It's an issue that I think we understand unless there are any other questions.

MR. GRANT: Chairman, if you would indulge me for 30 seconds. Eddie Grant with NuStart. The real concern is if we come to a situation where we think it's impractical but an inspector thinks it is practical, what do we have to do to get the approval to go ahead and do it the way we would like to do it. The difference is if it's in Tier 1 then it requires an exemption which must be approved by the Commission themselves.

If it's in Tier 2 star the staff themselves can look at it and write an SER and say that's okay. We don't feel like it's worth burdening the Commission to get that approval and that is why we want it in the other situation.

MR. WILSON: I will have to indulge themself then. I'm the expert on the change process.

CHAIRMAN RAY: Guys, this is not a place where I think we need to debate this any further. It's been adequately explained. I think there is more than one point of view. There is the question of uncertainty in the definition of the word impractical.

There is a question of the incentive of

doing things when they can be done as soon as they can be done versus putting them off until later. There is the incentive to have things in place when they are done so as to provide the maximum assurance. We understand all of that. There is more than one simple thing here and it's not just an editorial debate.

MEMBER BANERJEE: But in broad terms everything which is safety significant is in Tier 1, I take it.

MR. GRANT: We would agree with that. Yes, we would agree with that.

CHAIRMAN RAY: And, therefore, the uncertainty and what's impractical and whether or not you should have flexibility to do things as soon as they can be done versus putting them off. Again, it's not something -- at least I don't see any opportunity for us to help resolve this dilemma so thank you for explaining it to us but let's move on.

MEMBER BROWN: All right. I'll be quiet.

CHAIRMAN RAY: I don't think we are trying to optimize the project management if there is a big bow wave built up of things you could have done sooner and now you are going to have to do it at the end because if was practical to do so and somebody thought it was better to do it that way, well, I'm not sure it

has the safeguards implication.

Okay. Moving on.

MR. COMAR: Manny Comar again. I'm going to ask Greg Galletti to come and talk about initial test program both for the DCA as well as for the Bellefonte. Thanks.

MR. GALLETTI: Good morning. My name is Greg Galletti, Senior Operations Engineer in the Office of New Reactors. I'm the Quality and Vendor Branch. I work for Juan Peralta and I'm going to talk to you today about both the AP1000 DCD as well as the Bellefonte application with respect to the initial test program.

If you look at that first slide you'll notice in Section 14.4 for COL Applicant Responsibilities there is a host of issues that were standard information items. I will focus on several of those when we get to Bellefonte.

For AP1000 on the next slide specifically what I would like to talk to you about is the COL Applicant Responsibilities as it relates to the various topical reports that you heard about earlier today, as well as the clarification of some of the test requirements for first-plant and three-plant-only tests.

As you've heard with respect to test specifications and procedures, Westinghouse proposed the methodology that they incorporated into a Technical Report-71A to identify test specifications and test procedures. The methodology as we reviewed it was apparently inconsistent with the regulatory guidance and Regulatory Guide 1.8 Rev. 3 which is applicable to the COL applicants.

Specifically the TR-71 proposed a description of the development process and a listing of the test specifications and procedures. However, it didn't go into enough level of detail to satisfy the COL information item. As a result, we rejected the use of the TR as an approach to resolve the COL information item and we ask that the information be put back in the DCB and the COL holder will be responsible for providing that free operation and startup procedures to the NRC prior to the plant tests. We'll get into the details of that as it relates to Bellefonte.

With respect to the conduct of test program, again Westinghouse proposed a topical report, TR-71B, to provide some information on program management descriptions outlining the startup administrative manual, SAM. Again, like the TR-71A

the TR-71B was inconsistent with regulatory guidance in Reg. Guide 1.68 again because of the level of detail that was provided in that topical report.

The basis is that the startup administrative manual is to provide administrative controls for the conduct of the initial test program. The TR-71B provided a list of the activities to be controlled during the initial test program but, unfortunately, the topical report didn't provide a description of how these activities are implemented or controlled and that is something that the COL application would have responsibility to provide. Hence, again, we were not able to come to conclusion that the TR-71B was sufficient to close the information item.

CHAIRMAN RAY: Okay. That being said, you weren't able to do it because we didn't have the information from the COL applicant?

MR. GALLETTI: Yes.

CHAIRMAN RAY: Okay. Is this a problem?

MR. GALLETTI: It's really not a problem. It goes back to the status quo which is that the COL holder or the applicant is the one that is responsible for providing it.

CHAIRMAN RAY: But I'm wondering why are

we talking about this at this point?

MR. GALLETTI: Only to clarify for you what the changes to the DCB were and how the staff looked at those issues and tried to resolve them with both Westinghouse and Bellefonte.

CHAIRMAN RAY: Okay. That's fine. Perhaps we can be succinct about it then in that regard. It seems like we are struggling to try and find where is the essence of a issue or a problem here and it doesn't seem like there is any.

MR. GALLETTI: Right. At this point there is no problem. It's just we want you, the committee, to understand that the reason why we didn't accept the TRs, the topical reports, is really it focuses on a level of detail issue.

CHAIRMAN RAY: Okay.

MR. GALLETTI: And only the COL applicant can provide that level of detail.

CHAIRMAN RAY: It seems apparent to me that's true, yes.

MR. GALLETTI: Okay. Next slide, please. With regard to the first-plant-only and three-plant-only tests, again, the Westinghouse had provided a topical report TR-6, that specifically explained that the information associated with those tests and those

tests will be performed by the COL holder as opposed to the COL applicant. It's not a very big deal. We just wanted to make sure that the timing was understood that it's actually the holder of the license that is going to be performing those tests.

MEMBER ABDEL-KHALIK: Has the staff or the applicant considered including in these first or three plant tests a test to demonstrate the IRWST can successfully drain into the vessel in the presence of trapped noncondensable gases in the lines?

MR. GALLETTI: I'm afraid I don't have that detail. Can somebody on the staff answer that question?

MR. PERALTA: This is Juan Peralta, NRC staff.

MR. GALLETTI: Yes, sir.

MR. PERALTA: These programs are in a research type of environment. Even the first-plant-only versus three-plant-only tests were a departure from the traditional test program. These are significant transients for AP1000. One of the conditions of the test is it had to be practical. You cannot subject the plant to every conceivable -- I mean, we can't simulate the conditions but there will be a significant probably impractical test.

MEMBER ABDEL-KHALIK: How do you know that? How do you say that right off the bat?

MR. PERALTA: Well, if you talk about simulating -- when you talk about simulation of an actual event.

MEMBER ABDEL-KHALIK: No. We are not simulating an actual event. We are just saying that later on in a transient the IRWST is suppose to provide water into the vessel by gravity draining into the vessel. One of the uncertainties both in the design and in the calculation space is what happens if you have trapped noncondensable gases in the line? If you can demonstrate that has no impact on the ability of the system to function, then I think that would eliminate the uncertainty.

MR. PERALTA: That was an issue that should have been placed in the license in AP600 when we did significant specification testing. The intent of this program is not to demonstrate the behavior of the systems.

MEMBER BANERJEE: Maybe it would help if you tell us what these first-plant-only and three-plant-only tests are. Do you have a list of them that you could show us? Can you put them up on a slide or something? If not now, you can do it later. I think

that would clarify it.

MR. GALLETTI: Shall we come back to that?

MEMBER BANERJEE: I think continue.

MR. GALLETTI: Okay. Next slide, please. With respect to the Bellefonte specifically I wanted to talk a bit about essentially Section 14.4 which is the COL applicant responsibilities. Again, the highlighted area here is for the test specifications and procedures, conduct of test program, and the interface requirement.

Not to belabor the point because we've heard it many times but for 14.4-2 test specs and procedures, and 14.4-3, conduct of test program, what the applicant actually provided was a level of detail that was sufficient for the staff to make a finding that once they get the design detail associated with the plant during construction and the "as-built" and populate that information into the procedures, the procedures will be satisfactory.

What Bellefonte had provided the staff was an additional level of detail which was not available to us in those topical reports essentially outlining what content the procedures will have, roles and responsibilities of the staff, requirements for retesting should design changes be made in the field.

Those sorts of levels of detail were provided in their responses to these standard questions. With respect to --

CHAIRMAN RAY: Hold on. We're getting two forms here it looks like. Hold on a second. Who wants to then speak to answer Professor Banerjee's question?

MR. CUMMINS: Ed Cummins. I would offer that we have a list of the three-plant-only test and we would be happy to tell you what they are. Chuck Brockhoff would be happy to do that.

MR. GRANT: They are on the next page.

CHAIRMAN RAY: Okay. Whoever is designated for Westinghouse go ahead and speak.

MR. BROCKOFF: Go to the next page if you would, please. This is Chuck Brockoff from Westinghouse. The list of the first-plant test and the three-plant test should be on the scene. I can't actually read them because of the size.

Concerning the IRWST test, what we do is we take the squib valves out and replace them with a text fixture to simulate the resistance and we do injection tests from the IRWST to be able to dump outside of containment to inject into the reactor coolant system and also to inject through recirc

lines.

MEMBER BANERJEE: At what point do you sort of look close to where the DVI line enters the vessel?

MR. BROCKOFF: It's from the refueling water storage tank completely into the vessel. The purpose of the test is to measure the flow resistance through the lines that they match what we predicted and calculated and tested and used in safety analysis, that the "as-built" configuration and resistance matches.

MEMBER ABDEL-KHALIK: Without having looked at it in detail you cannot say that conducting this test in the presence of noncondensable gases to demonstrate that you would be able to drain the IRWST, you can't say that this would be an onerous or impossible or difficult or dangerous test. Can you?

MR. BROCKOFF: Well, we actually do it in the presence of noncondensable gases. The reactor coolant system is at atmospheric pressure and we are injecting --

MEMBER ABDEL-KHALIK: Noncondensable gases in the line?

MR. BROCKOFF: The noncondensable gas is not an issue in the injection line. Generic Letter

2008-1 addresses it for suction lines of pumps which we don't have that issue because it's a solid injection head down to there. In the discharge line going into the reactor coolant system the vessel is at atmospheric pressure and we actually test this.

MEMBER ABDEL-KHALIK: So there is absolutely no possibility that any noncondensable gas can accumulate between IRWST and the last valve before that water enters the reactor vessel?

MR. BROCKOFF: It's actually an upward slope from the valve to the tank, I believe. It would be no different than the injection conditions during at-power because you set up the plant beforehand -- set up the system beforehand just like you would during plant conditions.

MEMBER BANERJEE: There are vents along that line, aren't there? There is venting?

MR. CUMMINS: This is Ed Cummins again. I think this discussion doesn't fit here. This is Chapter 15 sensitivity to issue question.

MEMBER ABDEL-KHALIK: This is a test program.

MR. CUMMINS: The test program is determined and certified. I don't believe it's really in the scope of our review here.

CHAIRMAN RAY: Ed, stick on the subject at hand. Unless you want a letter commenting on this, which I don't think we do, let's try and address the issue that has been raised here, is it practical or not to test the condition that Said has postulated.

MEMBER ABDEL-KHALIK: You are essentially doing the test.

MR. CUMMINS: We are doing a test to verify the flow resistance in the line because if the flow resistance was much different than our design assumption, then the flow rate would be different at the various conditions of the injection.

MEMBER BANERJEE: This is only when you startup the plant, when you are doing full startup.

CHAIRMAN RAY: This is the first-plant test?

MR. CUMMINS: The first-plant tests are listed there. There is an ITAAC associated with the resistance in the line because at least it's possible that the "as-built" condition in any plant was slightly different than the as-design condition and you really need to verify that the "as-built" condition is acceptable in terms of line resistance.

MEMBER BANERJEE: Are these tests only done before startup of the plant or do you do any

tests of the injection line during the operational time?

MR. BROCKOFF: This is Chuck Brockoff again from Westinghouse. There is also a new set of tests that were established that are performed on a 10-year basis as part of the in-service testing activities we do in table 3.9-17. For each of the passive systems including the control room, the passive control room pressurization, they are done on a long-term basis every 10 years over plant life.

There is initial testing, the first-plant test, the first-three-plant test, there is pre-opt test for every plant in addition to these for the passive core cooling and then there is a 10-year operability testing that is done. These tests were all worked out with the staff to look at the performance of the system both beginning for the first plants and for all the continuing plants, following plants.

MEMBER BANERJEE: And you do test injection from the IRWST?

MR. BROCKOFF: Yes. The reason you do that is, for example, the maintenance control program you would monitor what is done but there is a possibility potentially that something could alter the resistance. Say somebody dropped a small tool or

something. These intermediate tests then, the system-level tests, verify the resistance and the performance of the safety systems over plant life.

MEMBER BANERJEE: I guess the concern -- I mean, I can't speak for Professor Abdel-Khalik -- that these noncondensibles coming out in the safety injection line is an issue we're dealing with right now. The question is you can try to design it out so you can detect it and vent it but assuming that somewhere they are there if you have a detection system, then vent them. I guess we are trying to understand whether you can do a test, a startup or something, so that you are going to sweep the noncondensibles out even if you have them.

MR. CUMMINS: Ed Cummins. My recommendation is we see your interest in noncondensibles. I think we should take an action associated with the review to have a presentation on noncondensibles, how we avoid the problem and include how we could test for the problem. I believe that fits in with the Chapter 15 discussion.

MEMBER BANERJEE: Right. And it may be a test that you could do not at the plant.

MR. CUMMINS: You could do it at a test facility.

MR. BROCKOFF: This is Chuck Brockoff. I would add one other point of clarification. Many of the issues that exist in current plans with gas coming out of solution have to do with the fact that we have dual-purpose charging pumps so they get hydrogen from the VCT.

MEMBER ABDEL-KHALIK: I understand. The issue here is quite different than for pump systems. The issue is that you have a relatively small driving head and whether or not you can actually clear any noncondensible gases in a gravity-driven system.

MEMBER BANERJEE: Who knows?

CHAIRMAN RAY: Well, but your original goal was to get some response on the practicality of doing that.

MEMBER BANERJEE: Yes.

CHAIRMAN RAY: I don't know that you have gotten any response yet.

MEMBER ABDEL-KHALIK: They will take it under advisement and come back.

MR. BROCKOFF: We have a promise to answer that question.

CHAIRMAN RAY: Anything else?

MEMBER ABDEL-KHALIK: That's it. Thank you.

MEMBER BANERJEE: I also wanted to ask you about do you do any tests of the ADS-4 system or is it all off-line?

MR. CUMMINS: Ed Cummins again. There is no test of the ADS for at pressure. There is test of the valves so that you prove that they open separately.

MEMBER BANERJEE: Are they done at the plant or they are done off-plant?

MR. CUMMINS: They are done off-plant, I believe. We have done, actually, two sets of ADS-4. I'll say prototype design verification type tests already.

CHAIRMAN RAY: Okay. Did you want to pursue the list any further? You've got a hardcopy here. All right. Let's circle back and get Greg going here again and resume where the heck we were.

MR. GALLETTI: We are going to start on page 13. Again, just to summarize with respect to the first COL information item on pre-operational and startup testing, again, as part of the Bellefonte response to staff questions they have provided an adequate develop process that is consistent with regulatory guidance.

They also committed to provide us with a

schedule to support operational program readiness as well as committed to provide both the test specifications and the actual test procedures when the design detail is sufficiently mature that those test specs and procedures can be developed.

At this point we are holding this as an open item simply because that level of detail is not currently available. The specs and the procedures have not actually been developed, as you know. Right now there is a proposal to have this as a licensed condition.

With respect to the second information item with regard to the site-specific --

CHAIRMAN RAY: Let me pause for just a second here. It seems to me like although this may seem simply like stating the obvious that you can't know something before its time, nevertheless, as was just illustrated by the discussion that we had, the content of the test program may be of significant interest to certain of my colleagues here who have concerns about how the systems are going to function and have we specified the right set of tests and so on. It's a subject that I'm not sure we're done with simply because we get through chapter 14 here today.

MR. GALLETTI: Certainly. With respect to

the startup administrative manual, again, what the applicant has provided in response to questions is sufficient in terms of describing the SAM content consistent with regulatory guidance. They also provide changes to the initial test program that will be --

CHAIRMAN RAY: The microphone is --

MR. GALLETTI: Again, the adequacy of the administrative controls for changing the test program remains open. Again, when the design is mature enough that the SAM can actually be developed the staff will be provided that administrative manual for review and improvement.

Finally, next slide. With respect to the interface requirements, as was called out earlier this morning by Westinghouse some of the site-specific design features of the plant which are not standardized had to be addressed by the applicant. In STD COL 14.4-5 they did provide the test abstracts for the following systems but I won't list them for you. We did review those test abstracts and found them acceptable and we did not have any open items with this remaining COL.

That's all I have on that topic. Any questions?

CHAIRMAN RAY: No, I don't think we have anymore questions but it is -- on one level it can seem like just an administrative process matter but the content of the test program can become an issue that we revisit.

Anything else on Chapter 14? All right. Thank you. We'll move now to Chapter 17.

CHAIRMAN RAY: Eileen, we are going to ask the staff and make a similar request to the applicants to revise the schedule to discuss Chapter 4 ahead of Chapters -- well, I guess 19 and 16. Move it up ahead of the break as it shows on our schedule here today.

MS. McKENNA: So you would like to have that --

CHAIRMAN RAY: Right after lunch, yes.

MS. McKENNA: Right after lunch?

CHAIRMAN RAY: According to the present schedule anyway.

MS. McKENNA: We'll double check with the staff. They are here today. Thank you, Robbie. We appreciate it. Chapter 4 is something of great interest and we want to make sure we do justice to it.

CHAIRMAN RAY: Okay. Is that okay with the applicants that we do Chapter 4 right after lunch instead of as shown on the agenda as the last item of

the day?

MR. SISK: Mr. Chairman, that should work. Actually our SME is coming in at lunchtime so we shouldn't have a problem.

CHAIRMAN RAY: Thank you. All right. Let's pick up then and try and complete Chapter 17 before we take a break. Let's have order please. Go ahead.

MR. SISK: This is Rob Sisk with Westinghouse. Chapter 17 we had broken into two parts. I'm going to talk about the QA portion first. Chapter 17 goes into the quality assurance aspects of the program for design and construction operation phase, procurement and fabrication.

To just jump to the chase, we didn't have any significant changes or issues with this portion. There was a clarification to incorporate ASME NQA-1 from our project quality plan into the QMS which is the quality program that we follow for the AP1000 design. Very bluntly that is where we are in quality assurance space.

CHAIRMAN RAY: Thank you for your succinct comment. Much appreciated.

Tom, are you up next?

MR. SPINK: Yes. I would just like to

point out that this is one of the places in the COLA where we had the exemption and the numbering scheme takes place. We have a couple of new sections and a renumbering of sections in 17.5, 17.6, 17.7, and 17.8 by way of note. We have a number of COL items related to our responsibilities for quality assurance.

During the design phase we utilized TVA's current Quality Assurance Program. During this phase it's primarily through our oversight contractors, Westinghouse and Enercon who provided the safety related inputs for the development of the application.

17.5-2, quality assurance for procurement, fabrication, installation, construction and testing. We included as an enclosure to the application our proposed Quality Assurance Program description which is based on NEI 06-14A. For Quality Assurance Program for operations, again, that is included in the proposed Quality Assurance Program description.

We had probably the winner for open items in the Chapter 17 review. Six of the open items relate to the NEI template. There were a number of issues where additional detail definition was not in the current approved version of the NEI template. The staff and industry are working together to revise that template when the staff approves the next revision of

that NEI template. We will adopt it and that will address all the open issues.

There are a couple of other open issues. One is we received a notice of violation as a result of our hydrology, probable maximum flood calculations back in the early part of 2008. The NRC will schedule a reinspection once all those calculations are revised in accordance with our QA Program to assure that we have dotted all the I's and crossed all the T's and that it's in conformance with all applicable requirement.

MEMBER BANERJEE: When would you estimate this is going to be done?

MR. SPINK: Right now. We should be done in December. We would anticipate then we would be prepared for that inspection anytime after the first of the year.

MEMBER BANERJEE: Will be get a chance to look at that documentation that they submit to the NRC?

CHAIRMAN RAY: Are you talking about hydrology?

MEMBER BANERJEE: Yes.

CHAIRMAN RAY: Yes.

MEMBER BANERJEE: Maximum flood?

CHAIRMAN RAY: Stephanie.

MS. COFFIN: Yes. That's covered in Chapter 2.4 Hydrology so the staff has a very detailed rigorous review of that area.

MEMBER BANERJEE: I think that would be of interest to some of us.

MS. COFFIN: We certainly plan to bring it to you. 2.4 probably won't be presented to the ACRS this calendar year because of the inspections and a lot of detailed technical review actually is going to happen in 2010. When you see Chapter 2 this calendar year it will be without hydrology.

CHAIRMAN RAY: Thank you.

MR. SPINK: Another open item related to a planned inspection of our QA Program oversight of our suppliers that we anticipate after the first of the year as well.

The last open item has to do with clarifying some documentation. There were a number of submittals that kind of crossed paths and it wasn't perfectly clear which Reg. Guides we had committed to, etc., and all that. We are in the process of providing documentation to clarify exactly what our position is on those Reg. Guides. We are in agreement with the staff in terms of what the answer is.

CHAIRMAN RAY: Okay. That's all right. Anything else, Tom?

MR. SPINK: That's it.

CHAIRMAN RAY: All right. Staff, Chapter 17 except for 17.4 and 17.6.

MR. JAFFE: Dave Jaffe for the NRC staff. Phyllis Clark who is the chapter project manager for Chapter 17 couldn't be with us today so I'll be sitting in her chair. Manny Comar, again, will be addressing the COL applicant.

We have with us Juan Peralta. Kerri Kavanagh who is one of the lead reviewers for Chapter 17 could not be with us today. Greg Galletti will be presenting for the NRC staff. Malcolm Patterson, who hopefully will be arriving shortly, will addressing elements of the PRE that are an integral part of Chapter 17.

MR. GALLETTI: Okay. Again, good morning. My name is Greg Galletti in the Office of New Reactors, Quality Assurance Branch. I would like to discuss with you the Chapter 17 for the AP1000 DCD as well as the Bellefonte COL application.

If you look at the slide here you'll note that we did have one open item related to Section 17.3 of the AP1000 design. That open item is actually a

place holder for an inspection. I'll get into some of the details on that.

With respect to the Bellefonte review we did have, as you just heard, several open items mostly related to the content of the Quality Assurance Program description which, again, is based on the NEI template 06-14A. The way we are approaching these is through working with the industry to modify the template which will then be adopted by the COL applicants.

Next slide, please. With respect to the Westinghouse AP1000 DCD in Section 17.3 on QA during the design phase we did have a question for Westinghouse with respect to what Quality Assurance Program is governing their activities during this design phase.

In response -- go to the next slide -- Westinghouse responded and they committed to use the current Westinghouse Quality Management System, QMS, Rev. 5 which is a document that is based, in essence, on NQA-1 1994. The staff had previously reviewed and approved that Westinghouse QMS document for the purposes of overseeing the Quality Assurance Program at Westinghouse. Given that response we did not have any questions.

Next slide, please. With respect to the QMS one of the things that the staff is engaging in with the industry is to do actual implementation inspections of these Quality Assurance Programs. It is one thing to have the program describe the process consistent with the regulation, we would like to go out and actually witness the applicant's or, in this case, the designer implementing the QA Program for the purposes of the design effort.

Back in, I think, October, November, 2008 we performed an inspection at Westinghouse. The purposes of the inspection was to ensure that they were complying with 10 CFR Part 50, Appendix B, Quality Assurance, as well as their 10 CFR Part 21 program.

As a result of the inspection we identified three nonconformances. They were identified in the areas of design control, control of purpose material equipment and services, and instructions for drawings.

Westinghouse had provided the staff with a description of the corrective actions to address the issues and prevent an occurrence. The staff has reviewed and agreed with those corrective actions has proposed. The open item that we currently have is to

go back and perform a future inspection of the Westinghouse implementation, the QMS, to look at two things. One, how they have implemented these corrective actions as well as looking at other aspects of how they use the QMS for the detailed design work of building the AP1000.

CHAIRMAN RAY: Was there any common cause or cross-cutting issue or whatever you want to call it?

MR. GALLETTI: To the nonconformances?

CHAIRMAN RAY: Yes.

MR. GALLETTI: No. They were essentially within the criteria specified here. There was nothing that linked one nonconformance to the other in terms of a gross programmatic weakness or deficiency in the QMS program.

CHAIRMAN RAY: Okay.

MR. GALLETTI: With respect to Bellefonte we reviewed section 17.1-5. We did have a question in 17.1 regarding, again, what quality assurance program is governing the design activities prior to COL issuance for Bellefonte.

Then we had several questions in Section 17.5 regarding what the QAPD that is going to govern the design construction and operation of the facility

following the COL issuance, as well as some issues associated with some of the standard COL information items. For the purpose of this I will focus on the two areas related to the QAPDs prior to and following COL issues.

With respect to the COL applicant using a quality assurance plan prior to the COL issuance, as you've heard previously, TVA has committed to use their current Quality Assurance Program, which has been reviewed and approved by the NRC for oversight of their contractors. Again, based on that response we had no issue with that.

Following the COL issuance the QAPD, which is part of the application, was reviewed and that document contains a program description which is consistent with the NEI template. We do have one open issue regarding the incorporation of commitments to certain reg. guides, namely Reg. Guide 133, into that QAPD. We are looking to resolve that issue as well as resolve some of the other standard COL items that had come up through adoption of changes to the NEI template which will then be a topic by the applicant themselves.

With respect to this NEI 06-14A template, again, if you are not familiar with it, it provides a

generic template for early site permit and COL applicants to develop a QA Program consistent with the regulatory requirements. The staff has previously reviewed and approved NEI 06-14A Rev. 4. There were some generic issues identified during the COL application reviews that are being addressed through a revision to this NEI template.

The general areas of these generic issues have to do with organizational descriptions embodied in the QAPD, again application of certain regulatory guidance, and the six Bellefonte open items. Most of those were editorial in nature.

Next slide, please. Like Westinghouse we performed a QA implementation inspection at the applicant to ensure that their Quality Assurance Program that is currently being used for design and pre-COL issuance activities is consistent with the requirements.

We did a focused inspection to verify that the QA Program was effectively implemented with regard to the simulated open-channel hydraulics model. Again, this model, as you know, is referenced in various sections of the COLA. As a result of that inspection effort there were violations identified in the areas of design control, software V&V, and records

control

MEMBER BANERJEE: Can you expand on that a little bit what you mean by violations here?

MR. GALLETTI: A violation is if the applicant does not meet the regulatory requirements as defined in 10 CFR Part 50 Appendix B. That would be considered a violation of that requirement.

MEMBER BANERJEE: So let's say software V&V. What is it that you found that was in violation?

MR. GALLETTI: I don't have the specific details.

Juan, do you know?

MR. PERALTA: This is Juan Peralta, NRC staff, again. There were some issues with respect to how TVA had been controlling the channel hydraulics code and what sort of verification validation that have been done to verify those codes. It was primarily a design control issue.

MEMBER BANERJEE: I still don't understand. When you are validating or verifying a code there are certain procedures but it's also in the eye of the beholder. Validation is sort of a process which is always ongoing. Is there sort of a concrete target that it has to be validated to this extent against these experiments or whatever?

MR. PERALTA: Software verification validation is a very unique term. It's a process that they go through where they specify what elements of the code need to be verified up front. It's group tests and design reviews and documentation. It's a proof of concept that, in fact --

MEMBER BANERJEE: Okay. Let's cut it short. Can you send us the documents so we can take a look at it?

MR. LEE: I think the short version is I sat in on an earlier meeting and I think TVA had been using an older flood routing software program that was pre-Bellefonte. I think it was being now applied to Bellefonte and there were some issues regarding documentation on the code.

Andrea, I think, and some other staff sat in on that meeting as well so I think that's really what it comes down to. Just older flood routing routine that had been used by TVA for many, many years to manage the water supply, if you will, within the TVA reservoir system. This is just providing the documentation.

MEMBER BANERJEE: Is it more of a procedural thing?

MS. COFFIN: There is a lot more to this

and so I suggest that we provide you a detailed briefing on hydrology.

MR. LEE: I think there might be a summary of the meeting.

MEMBER BANERJEE: Right, but that doesn't apply to us.

CHAIRMAN RAY: Stephanie, is it an inspection report that we're talking about?

MS. COFFIN: Would you like just the inspection report or would you like ML numbers for any public meetings related to this subject?

MR. LEE: Give us the whole --

MEMBER BANERJEE: Give us the whole package.

MS. COFFIN: Okay.

MEMBER BANERJEE: Everything you have.

MS. COFFIN: Okay.

CHAIRMAN RAY: Because there are two kinds of issues here. The narrow topic is this a QA Program issue alone? Evidently not but to what extent it is a QA program the issue is important also. We'll get that. Mike Lee will ensure the subcommittee members get what they --

MEMBER BANERJEE: Is this the main unique aspect of this site?

MS. COFFIN: It's probably one of -- this is -- Andrea, you can jump in anytime. This is probably one of the most complicated hydrology reviews the staff has ever undertaken.

MS. STERDIS: This is Andrea Sterdis from TVA. This is our critical path, site-specific issue. We have consistent with our corrective action program entered this immediately into that program back in February of 2008 or March, when we got the report. I think it was March 2008. We, of course, started following guidelines of the program, looking at extent of condition from the perspective that Mr. Ray just made that this is a QA issue. We also are covering this issue specifically.

Mike appropriately described the issue with I would be hesitant to call it old software because it is software that we use and was originally referenced in a copy of the Reg. Guide. TVA uses this to manage our river system. It is legacy software from a nuclear perspective. In other words, it's software that was developed and utilized outside of the nuclear aspects of TVA.

MR. LEE: I would agree with that stipulation.

CHAIRMAN RAY: All right. Where are we?

Are we done?

MR. GALLETTI: Almost. Page 10, again, as Andrea just mentioned, TVA did provide some response to the violations and committed to implement those correction actions. We do have one open item associated with doing a follow-up inspection, specifically to look at the implementation of those corrective actions. We do have a separate open item to perform a limited scope inspection of TVA as it relates to their oversight of suppliers.

Next slide. In conclusion, we have used the guidance in Appendix B, Part 50, and the guidance in the SRP Section 17.5 for evaluating the acceptability of the AP1000 and the Bellefonte Quality Assurance Program documents.

The staff evaluated these documents and pending resolution of the remaining open issues we feel that the QAPDs in both cases complies with the acceptance criteria in the SRP and that the QAPDs provide adequate guidance for the applicant to establish controls that, when properly implemented, complies with Appendix B.

CHAIRMAN RAY: I guess one more question. Is it as simple as TVA did not heretofore apply Appendix B to this area of hydrology?

MR. PERALTA: It could be as simple as that but, as Stephanie and Andrea said, it's a very complicated model.

CHAIRMAN RAY: But now we're into hydrology. I'm just asking a question about Appendix B.

MR. PERALTA: Well, I guess in essence it's a code that's used for the whole TVA basin.

CHAIRMAN RAY: My question is, therefore, it seems to me like that's maybe a reason why Appendix B wasn't applied to it.

MR. PERALTA: Exactly.

CHAIRMAN RAY: Well, all right. Then the answer to the question, assuming your answer is accurate, would be yes.

MR. LEE: As Andrea said, it was a legacy code that was used to manage the basin which is --

MS. STERDIS: Well, Mr. Lee --

CHAIRMAN RAY: Well, I beg to differ. In my perspective, anyway, it's a question of what you are applying Appendix B to. Don't tell me about legacy codes. It's more a matter of what's within the scope of Appendix B-covered activities. This evidently was not. Now, you can correct me if that's not --

MS. STERDIS: The answer to your question is yes.

CHAIRMAN RAY: Thank you.

MS. STERDIS: That was Andrea Sterdis. I'm sorry.

CHAIRMAN RAY: It's simple to understand that way rather than get off into -- the issue of are we using the right code and validation and so on is a separate discussion. It's simple enough to say, well, we can't apply Appendix B to this because we have -- you know, this is TVA and it's our business.

Wait a minute. That could be misunderstood. What I meant was -- what I meant was this is our business to manage hydrology. I mean, it's part of a bigger enterprise so not applying Appendix B, to me, seems to be like a natural and logical thing to anticipate if I can put it that way, but Appendix B does apply and it, therefore, makes it an Appendix B issue.

The more fundamental question is the adequacy or the purpose at hand of the analysis that is being performed. Okay. My effort went awry but I was simply trying to illustrate that to me it was a question of we didn't apply Appendix B to this and that's why it appears in this part of the discussion

as an Appendix B issue.

MR. COMAR: Okay. We have talked about 17.1-6 minus 17.4 and 17.6 which relates to the Design Reliability Assurance Program and the Maintenance Rule. We'll have the applicant discuss that first and then we'll go after that.

CHAIRMAN RAY: All right. Our agenda calls for a break before we go to 17.4 and 17.6. We are running a little ahead of time which has nothing to do with the break one way or the other but because we are going to do Chapter 4 right after lunch, does anybody have a feeling one way or the other whether you would like plunge ahead with 17.4 and 17.6 which may make the break a little late? All right. We'll go ahead then with 4 and 6 and take a break after.

MR. JAFFE: For the staff we have Malcolm Patterson.

CHAIRMAN RAY: You ought to begin with --

MR. JAFFE: Excuse me. I'm so sorry.

CHAIRMAN RAY: We're getting into such a routine here that I can almost --

MR. SISK: Very quickly Chapter -- this is Rob Sisk, Westinghouse. Chapter 17.4, as mentioned earlier, covers the Design Reliability Assurance Program, frequently called D-RAP. The significant

change for that area for us was the incorporation of the maintenance rule for NEI 07-02A. There were only a couple of open items that were in the process of resolving the common-cause reactor coolant pump trip failure removal from PRA and it resolved the need to resolve an alternative D-RAP ITAAC. Very quickly, that's where we are.

CHAIRMAN RAY: Tell us more.

MR. SISK: Chuck, can you elaborate on the reactor coolant pump trip failure as a starting point?

MR. BROCKOFF: Yes, sir. The common note there was actually captured -- Chuck Brockoff, Westinghouse. The common-mode failure was actually modeled in the PRA. There was just an inconsistency in the table. We identified this through the expert panel review but it also should have been captured in PRA results and we are correcting that with an RAI that is in progress right now to send in.

CHAIRMAN RAY: RAI response.

MR. BROCKOFF: RAI response, yes. For the alternate ITAAC there is an ITAAC that exist for D-RAP. There is a question about the specific content. There were three suggestions for content and we are looking at the last item, I think, probably to discuss with the staff and resolve this.

CHAIRMAN RAY: Okay. Tom

MR. SISK: I'll be just as simple and brief. The Design Reliability Assurance Program we have incorporated the DCD program by reference. For the maintenance rule program description we have provided a standard supplement where we incorporated by reference the NEI 07-02A template or guideline.

We have one COL item. That is, again, a standard item that we provided in 17.5-8 and that was related to the operational reliability assurance program and it's integration with the Quality Assurance Program.

To cut to the quick, it's implemented by various operational programs, the Quality Assurance Program, our Maintenance Rule Program, the Tech Spec surveillances, the ISI program and ISD program all combine along with bring in operational experience and so on to form the implementation for our Operational Reliability Assurance Program.

CHAIRMAN RAY: Tom, what is your understanding of why we are discussing this as a separate issue from the rest of Chapter 17?

MS. McKENNA: This is Eileen McKenna. Let me just speak to that. It's really just a matter of who the presenters were and the topic area. That's

all.

CHAIRMAN RAY: I was trying to discern if there was something that caused it to be broken out separately this way. All right. Thank you.

MR. JAFFE: This is Dave Jaffe. As Westinghouse pointed out there were two open items associated with 17.4.

Next slide. I would like to introduce Malcolm Patterson from the PRA Licensing, Operations, Support, and Maintenance Branch 1.

MR. PATTERSON: Just to provide a little context and maybe to answer your last question, the reason these two are grouped differently is because the other sections were about the Quality Assurance Program. This is about Reliability Assurance.

The purpose of the Reliability Assurance Program is to assure that the reactor is design, constructed, and operated in a manner that is consistent with the design that is certified. It looks to assure that the SSC's don't degrade to an unacceptable level and that challenges to the SSCs are minimized and that they function reliably when they are challenged.

Originally it was proposed by the staff in a couple of SECY papers as a two-phase process, the D-

RAP, Design Reliability Assurance Program, and O-RAP, Operational Reliability Assurance Program. The staff requirements memorandum 95-0132 that came up provided some additional guidance from the Commission.

They pointed out that we didn't really need an O-RAP. We didn't need a specific program to accomplish reliability assurance activities that were already being accomplished by other programs that had been approved so we refer to those as OPRAAs now, Operational Phase Reliability Assurance Activities and they are scattered through other programs as was mentioned.

The Commission also directed that D-RAP would be verified in the ITAAC process, the Inspection Test Analysis and Acceptance Criteria Program. This has created some interesting challenges which are just now getting resolved.

Next slide. The issues that we had with the DCA were that there was excessive focus on the scope of D-RAP which SSCs belong in the list and why were they there rather than addressing the program itself, how are we going to assure the reliability of these things. That has been resolved. We'll get into a little more detail on that.

We also in our review wanted to focus on

the changes. There were a few things that were added. Actually there were also some things that could have dropped off of the list of things within the scope of D-RAP. This caused a change in the basis for why things were included in D-RAP.

Westinghouse elected not to remove things from the list, especially if the reason they were on the list was they had a Reliability Achievement Worth, or RAW, or two or more. This is the same criterion that applied in the Maintenance Rule Program. Some things were marginal.

They were just a little bit above or a little bit below 2.0. They elected to keep them in the program. Now they weren't in the program because they had this score and they were now left in the program by the judgment of the expert panel. We thought that was fine.

It did create a problem when we still thought the components belonged on the list because they had a high RAW or their common-cause failure had a high RAW or something like that. That was the reason for the discussion about the reactor coolant pump trip breakers. It's the common-cause failure of those trip breakers to open that has a high enough RAW that we wanted it to be recognized as a reason for

being included on the list. We have an RAI response that addresses that that is now a confirmatory item, not an open item.

As far as the COL goes, the issue the staff was concerned about was there were not plant specific additions to the D-RAP. The staff asked questions about the RAW water system, about off-site power. In their responses Westinghouse convinced us that we didn't need to have these things through the D-RAP. They did do some things. For example, there are now availability controls on off-site power when in modes five and six with the reactor coolant system partly drained. That issue has been handled acceptably to the staff.

Next slide, please. Sorry, previous slide. The other issue we were concerned about at the license phase, after the license was issued, was how was Bellefonte going to continue to monitor the D-RAP. There are certain controls that are posed on things that were identified as being D-RAP when the license is issued but there are always changes and those changes might cause other components to now meet the criteria for being included in D-RAP.

We wanted to know how they would kind of backtrack and ensure that for those SSCs that might be

added to the list make sure they were adequately addressed at least through fuel water.

As I said, they have kept items in the D-RAP. Once they were in they stayed in. The OI on the reactor coolant pump trip breakers have been resolved. We also have an improved D-RAP ITAAC. The problem we had with D-RAP ITAAC was that it isn't like any of the other ITAACs. Most of the ITAACs focused on looking at the "as-built" plant and comparing it to the certified design. We don't have this analogous situation.

There was originally proposed, and in the certified design, it called for a comparison of the estimated reliability of SSCs at the time of fuel load with the assumed reliability of SSCs at the time of design certification. This could have turned into an academic exercise because they were determined the same way.

There was also the risk that one might not pass the ITAAC because if new data came to light that a particular component was slightly less reliable than originally assumed, there was no out. That wasn't appropriate. The overall system safety could have been virtually unaffected. We went back and forth with the industry working group on ITAAC to try and

come to a better resolution.

Actually the clue that we found was in the staff requirements memorandum from the Commission when they said for safety related risk significant components the Appendix B QA program is an acceptable way of assuring they will be reliable throughout their useful life. We were looking for a comparable method of imposing adequate controls on non-safety systems and that is the resolution that we have in-house today.

Westinghouse proposed to apply the part of their QA program that applies to written assistance to everything that is in the D-RAP that is not safety related. It's being handled in a manner that is similar to safety-related components. It looks like it will close out the item.

On the COL side they provided a supplement to the COL that explicitly identifies which programs are being applied. Our concern was from the DCD we had some Westinghouse programs that were being tried but once the license is issued, of course, all of these programs will fall under PBA's umbrella. A plant specific supplement in 17.5 to identify their programs and a standard supplement in 17.4 to 17.5 was a little convoluted but it's an elegant solution that

satisfied us.

They also provided a supplement to describe their program. It's a standard supplement and it has been satisfactory to the staff so there really are no open items left in this area.

CHAIRMAN RAY: Okay. Anything else you would like to say, Malcolm?

MR. PATTERSON: No.

CHAIRMAN RAY: Maintenance Rule.

MR. PATTERSON: Ah, now onto 17.6. There was back and forth during the phase when Westinghouse was issuing technical reports because NEI 07-02 had not yet been endorsed by the staff. Once it was modified and endorsed by the staff, we would just end up with a corporation by reference and the remaining issues are when they would start to implement the maintenance rule and how they would make sure that the scope of the maintenance rule remained correct all the way through to fuel load.

Just briefly, so you are aware of the contents of the NEI document -- next slide, please -- there is a description, a standard description for the maintenance rule program that all of the AP1000 COLs are using.

Next slide. The template also addresses

these issues that are inter-related between the maintenance role and the other activities on the site. With all of these details covered in a way that the staff has already endorsed, we have no issues on 17.6.

CHAIRMAN RAY: All right. Any other comments on 17.4, 17.6? Okay. What we'll do then is we'll go ahead with the break.

Rob, are you guys ready on Chapter 19 before lunch instead of after?

MR. SISK: Yes, we can pick that up after the break.

CHAIRMAN RAY: All right. Eileen.

MS. McKENNA: Staff is here. The only comment I would make is we may not finish PRA before lunch depending on how it progresses so the issue about picking up Chapter 4 immediately after lunch may need to be revisited. That's all.

CHAIRMAN RAY: Okay. That's fair. On the other hand, I understand we can't proceed with 4 until after lunch because of the availability --

MS. McKENNA: That's fine. We may have to finish the staff presentation after lunch.

CHAIRMAN RAY: Sure. I understand all of that. Okay. If there is nothing else, we'll take a 15-minute break. Return, please, at 20 minutes to

11:00.

(Whereupon, the above-entitled matter went off the record at 10:24 a.m.)

CHAIRMAN RAY: All right. So we have managed to get ahead of schedule which is good, particularly on a Friday afternoon. Friday afternoon is approaching I should say. We will pick up now with Chapter 19. Rob, I guess you are on first, as usual.

MR. SISK: Thank you, Mr. Chairman. I'm going to turn it over to Tom Ray, the licensee lead on Chapter 19.

CHAIRMAN RAY: We need to get you a name tag.

MR. RAY: The last name should be easy to remember.

CHAIRMAN RAY: I just want to display it is the point.

MR. RAY: Again, my name is Tom Ray. I'm from Westinghouse, licensee for Chapter 19 here to discuss PRA. 10 CFR 52 requires PRA be submitted as part of our application for design certification. Our PRA provides for the evaluation of design including plant containment and typical site analysis that consider both internal and external events.

If you look at Chapter 19, Chapter 19 is

broken down into Probabilistic Risk Assessment both looking at the internal and external events. The ex-vessel, severe accident phenomena, additional assessment of the -- additional assessment of the AP1000 design features. You have equipment survivability assessment, shutdown evaluation and now the malevolent aircraft impact.

Next slide, please. If you look at the description of major changes for the PRA since DCD Rev. 15, the first one we looked at we addressed site-specific design and site-specific external hazards in a standard manner. We did an external screening analysis to generate generic PRA. The analysis was representative of the COL sites.

The next major change was going from PRA software change. We went from the proprietary WESSAGE software to the more widely used CAFTA which is Computer Aided Fault-Tree Analysis model.

CONSULTANT KRESS: Did you do anything to be sure that you got the same results with the two different models?

MR. RAY: Actually, the results are very similar. They had minimal impact on the PRA.

Rich, can you provide more information on what we did?

MR. ANDERSON: Yes. We went from the event tree, fault-tree type PRA to a one-top fault-tree PRA. The results that are listed in our technical report show that the core damage frequency went down very, very slightly. It went from 2.41 to approximately 2.3^{E-7}.

We have since identified -- with the help of the NRC we have identified a small glitch in error in the model and we have re-quantified that. The number is actually back to 2.41.

CONSULTANT KRESS: And did you get the same distribution?

MR. ANDERSON: For the most part. There were some discrepancies in the sequences in the low-power shutdown model. We currently have not finished our quantification after we found the problem. That is due out in October so we are working on that.

As you may well know, in PRA space as other items come forward we have to address them and look to see if we have some conservatism here and there and we are working on that.

CONSULTANT KRESS: Did you do a log on your SSCs?

MR. ANDERSON: Yes.

CONSULTANT KRESS: Did that change any?

MR. ANDERSON: Not for the at-power model. It was really close.

MR. RAY: Just for the record, that was Rick Anderson from Westinghouse, our technical help for PRA. I forgot to introduce him. Rick mentioned this, too. As part of that modeling change we also updated the software for more specific design changes. INC being one of those area. The last major change for Chapter 19 would be the addition of Appendix 19F regarding the level and aircraft impacts.

CONSULTANT KRESS: Just a probability analysis rather than consequence?

MR. RAY: 19F?

CONSULTANT KRESS: Yes.

MR. RAY: Actually, 19F looks at the design features. It doesn't go into detail but just provides the information about the fact that the AP1000 can withstand and the scope of it is not just the impact, the initial impact from the aircraft but parts and pieces and fire information. All that is in 19F.

MR. CUMMINS: This is Ed Cummins. It's not probabilistic at all. It's in 19 because the malevolent aircraft is also beyond design basis.

MR. RAY: Okay. Talking about the open

items for Chapter 19. You will see that the numbers are kind of out of order and there is a reason for that. Both 7 and 13 we are working to resolve at the same time the OI 7, again, was the update and resolved and re-quantified PRA model and any DCD changes that might be necessary. As part of that you put in open item 13 which is an update of the shutdown PRA risk and, again, any DCD changes that may be necessary.

No. 12 was maintaining an acceptable seismic margin for hard-rock high frequency sites and we are still working with the staff on that margin. 14 was a request for more information on the containment inventory of radionuclides used for equipment arguability evaluation. The last open item is a holder open item for the NRC to development their guidance for the review of the malevolent aircraft impact.

CHAIRMAN RAY: Just comment a little bit further, Tom, on 12, the seismic margin.

MR. RAY: The seismic margin is basically you are looking at the equipment for the hard-rock high frequency. We are going through different issues with them right now as to what level of margin do you need for the ruggedness of the equipment throughout the plant.

MR. CUMMINS: This is Ed Cummins again. I think we have clear direction from the staff of what level we have to look at for seismic margins. It's one and two-thirds times the design basis. Westinghouse has some work to do here to re-look at the margins for our various equipment. There is a little bit a discussion.

I'm not sure we're completely in agreement on how or do you address high frequency input related to seismic margins. I think we would say that we approved the high-frequency input is bounded by the base case low frequency seismic and, therefore, so would the margins be bounded by the base case low-seismic seismic.

CHAIRMAN RAY: That's helpful. Thank you, Ed. That goes to, you know, what I was trying to glean from this line item here. Perhaps we'll hear more from the staff on that. Go ahead.

MR. LEE: Generic Safety Issue 199 relates to updated seismic hazard estimates for the eastern United States. Do part of your discussions with the staff account for that dialogue, if you will? I know the committee will be briefed later on this year on proposed resolution or path forward on that. Part of the issue is that there are revised seismic hazard

estimates for the East Carolina Seismic Zone and the Charleston site. Is that on your list?

MR. CUMMINS: This is Ed Cummins. I don't know. Maybe the staff knows.

MR. LEE: This is something to keep an eye on because some of the hazard estimates for some of the sites east of the Mississippi, I understand, have gone up. I understand there may be some changes in CDFs for some of the sites and not in a good way.

MEMBER BANERJEE: Somebody on the staff must know this. Right?

MR. LEE: I don't see anything.

CHAIRMAN RAY: Did you want to say something, Eddie?

MR. GRANT: Just that I don't think the staff folks are here today.

MS. COFFIN: Chapter 2 item.

MR. GRANT: That would be the geology folks from seismicity and I don't believe they are here today.

MS. COFFIN: 2.5. What I thought I heard the question from Mike is how does our conclusions on 2.5 get factored into the final PRA that applies to this particular site so whatever conclusions in 2.5 needs to be considered.

CHAIRMAN RAY: Okay. Everybody satisfied on that score? Let's proceed then

MR. GRANT: All right. My name is Eddie Grant. I'm with NuStart. I'll pick up from the COL application, Chapter 19. Content again for PRA discussion is the same as the DCD. In fact, for Sections 19.1 through 19.57 all we have is an incorporation by reference because it's all related to the design information from the DCD and we made no changes to those.

1958 we have incorporated a few changes. They don't yet show up in Rev. 1 of the COLA but through RAI responses we have made some changes in 1958 to provide more detailed -- provide detailed information to the staff about how we meet or how we are within, how the application of external events is representative for our site. We have provided that information to them to let them know that, indeed, the PRA that was in the DCD is applicable for winds, floods, and other external events.

PRA results and insights 19.59 was the one section that also included some COL items so if we could look at the next slide to address those. That is, where we did address them in 19.59. The last section of that, 19.59.10 has those items. Just a

quick item. There is one item here, or part of one of the items, 19.59.10-2b that we could address and that was the evaluation of site specific PRA external events. Again, we have provided that information to address that particular item. The rest of these --

CHAIRMAN RAY: Excuse me.

MR. GRANT: I'm sorry. Yes, sir.

CHAIRMAN RAY: Is applicable to what?

MR. GRANT: To our site. To the site specific external events.

CHAIRMAN RAY: I know, but which site are we talking about?

MR. GRANT: We are talking about TVA at Bellefonte in particular today.

CHAIRMAN RAY: I understand but he's talking so I'm not always absolutely sure.

MR. GRANT: I'm sorry. I do tend to wear several hats so I apologize for that. In this case we are talking specifically about Bellefonte. I would point out that this was a standard response so the other stations that are providing information on AP1000 have also confirmed that the information provided in the DCD with regard to external events for the PRA is also applicable to their sites. All our

numbers are --

CHAIRMAN RAY: This assertion of applicability I assume, as Stephanie said earlier, is subject to reconsideration of Chapter 2 of the COL.

MR. GRANT: It is indeed. We will point out as we get to the open items. There are a couple of those that are directly to that point. The rest of them you will see on this page and the ones on the next page all relate to "as-built" verifications so cannot be completed until sometime after we have gotten a COL and built a plant. We propose licensed conditions again to complete those items sometime after the COL is issued.

Next slide. There was also one set of supplemental information that we provided to address Reg. Guide 1.206 information which was a request for configuration controls information. We did describe our PRA configuration controls within the FSAR. The staff has looked those over.

Resulting from all of that review we have three open items. Two of those are directly related to the point that you brought up, Mr. Ray. One is to complete the hydrology impact review and once that is complete then if there are any changes resulting from that we'll need to reconfirm that, indeed, the PRA

still is representative for our site. As we have provided the information in 2.4 we believe it is representative but, again, should there be some changes resulting from the review by the staff, then we'll need to redo that.

The toxic chemical impact review is actually discussed in Chapter 6 so we will see that also in the fall. Again, that is something we would have to look at. There is discussion of identification of the toxic chemicals in Chapter 2 but then the evaluations of how they impact the control are in 6. When we get to those two chapters here before you, we'll again, if there are any changes resulting from the staff review, have to confirm that the PRA remains representative.

CHAIRMAN RAY: The word representative means conservative or enveloping?

MR. GRANT: Yes, sir. We could go back and put in the site specific numbers and here is the real thing for us but it's close enough that it wasn't worth the effort.

The last item, 19.59-1, is to complete the -- it's a placeholder basically to go back to the DCD open item should something come out of that that requires that we need to revise the COL to address

that, we will do so. If they satisfactorily resolve that within the DCD such that we need to make no changes, then we'll be done and that one will go away. If something does come from that and we need to address it on a site-specific or plant-specific basis, then this is an open item that we would resolve or respond to to do so.

Frankly, we do that with all the open items for the DCD. We watch all the resolutions and if anything comes out of that that would require a COL item, we are going to do that anyway. We would consider this one just as a place holder.

CHAIRMAN RAY: Understood. Questions?

MEMBER BROWN: Are you going to go on to the staff now?

CHAIRMAN RAY: Unless you --

MEMBER BROWN: I was just going to ask. If you look in here, there is the implication that you all factored in the new INC, some type of PRA evaluation. I am just curious since all the comments I've heard is that we don't model digital INC and DRAs in general so I was expecting some really insightful analysis of how this was done. I'm saying that a little tongue in cheek.

MR. ANDERSON: This is Rick Anderson

again. Yes, when we did the conversion from the WESSAGE software to the CAFTA software we also --

MEMBER BROWN: I have no idea what you just said.

MR. ANDERSON: We converted the model from one software package to another.

MEMBER BROWN: Okay. That's the PLA software package?

MR. ANDERSON: Right. At that time we did not convert the INC modules. Instead we looked at the new hardware and we developed the INC software PRA models from scratch. When we talked about our numbers being very, very close for the at-power PRA to what is in the DCD, that is the model that is represented with the new INC model.

MEMBER BROWN: How do you model it, though? Do you model it by boxes? Do you model it by control actions? Do you model it by inputs?

MR. ANDERSON: We models by -- the PRA model has where different items lead the INC to do their thing to support mitigation of accidents.

MEMBER BROWN: Okay. So you did it by control actuation. In other words, you need to shut down something like that, the chances of a failure or preventing it.

MR. ANDERSON: Right.

MEMBER BROWN: Your single failure, dual failure, whatever, even though it shouldn't.

MR. ANDERSON: Correct. For the PMS software, for the safety software, we had the four-channel system model. What we model is we model components and we model --

MEMBER BROWN: What do you mean components?

MR. ANDERSON: The individual components that are in the INC.

MEMBER BROWN: Like a microprocessor? Are you talking about cabinet level?

MR. ANDERSON: The input modules. All the modules that interface. Right, the entire -- we blackboxed, of course, the microprocessor part. It's looked at as one module.

MEMBER BROWN: I'm trying to get my hands around it. I find it a little bit -- you have actually modeled A-to-D converters coming off each sensor and then you modeled the input signal condition and then you modeled the microprocessor. Then you modeled the trip-level voting unit, etc., etc.

MR. ANDERSON: Yes. Yes, ma'am.

MEMBER BROWN: What type of insights did

you get out of that? Did you change anything as a result?

MR. ANDERSON: Most of the sensor modeling had been done previously during AP600 days.

MEMBER BROWN: I got that part.

MR. ANDERSON: There was back and forth there. We really did not need to iterate with the designers on the new hardware. It was down and we put it in.

MEMBER BROWN: It didn't change anything.

MR. ANDERSON: Didn't change anything.

MEMBER BROWN: There was one item in your PRA-based insights that's in one of the tables. I guess it's an appendix. No, it's not an appendix, I guess. Tier 2 where it said source range flux-doubling signal, the PMS. This is in blue. That is the only reason I knew you changed something. This is not an insightful derivation. I just looked for where you made changes. I was curious when it said now because of the flux-doubling now the PMS automatically closes to safety-related CVS. What is a CVS, by the way? Containment something?

MR. CUMMINS: No. Ed Cummins. This is boron dilution.

MEMBER BROWN: Oh, okay.

MR. CUMMINS: It's a boron dilution.

MEMBER BROWN: Okay. So you did something with it.

MR. CUMMINS: The CVS is Chemical Volume Control System.

MEMBER BROWN: Got it. All right.

MR. CUMMINS: We isolated the demin water from the process.

MEMBER BROWN: As a result of the analysis. Is that right or wrong? I got the flavor because you're triggering it to the doubling of the source range flux signal.

MR. CUMMINS: Right. This is shutdown protection against dilution of boron. If you get a doubling of the signal the protection system will close these valves independent of the operator.

MEMBER BROWN: That wasn't there before? My question is did you do this because the PRA showed that was a vulnerability or did you do it because of some insightful engineering analysis and judgment based on people looking at the system?

MR. CUMMINS: I'm a little beyond my realm here. I think we did it because we needed to meet some NRC requirement related to shutdown dilution, neither of those two suggestions. It was my a PRA.

MEMBER BROWN: Well, it's on the PRA insights. That's why --

MR. CUMMINS: We did change -- in the practicalities of it it's not doubling anymore. It's some other factor so we did change something.

MR. ANDERSON: It was added to the table. The table is a place-keeper to make sure that things that are modeled that are good are not changed because this table --

MEMBER BROWN: I'm worried about giving the impression that PRA modeling of that digital INC has some benefit so I was looking for one because I haven't heard any up to this date at various meetings. I'm trying to take George's place here to make sure we have some appropriate argument.

MEMBER BANERJEE: George would have the same view.

MEMBER BROWN: Oh, okay. Well, I didn't do too badly then. That's all I had. I think that kind of answered my question. This was not high-level high-scope type stuff.

CHAIRMAN RAY: All right. Anything else?

Serita.

MS. SANDERS: I'm Serita Sanders, the Project Manager for Chapter 19 of the Design

Certification Amendment. This is Manny Comar. He's the Project Manager for Chapter 19 of the Bellefonte COLA.

I would like to take this opportunity to acknowledge the staff review team which goes as follows. It's Malcolm Patterson who is our lead reviewer for the DCD. There is Mark Melnicoff who was the COL reviewer. There's Marie Pohida, Edward Fuller, and Bret Tegler who has also joined us.

Since Chapter 19 is weak and it's structured a bit different from all the other chapters, we have modified our style of presentation a little bit to give you something a little different so we are going to let our lead reviewer do the presentation. We feel that, Manny and I that is, that it would better serve the Committee.

MR. PATTERSON: Thank you, Serita. Fundamentally the structure of Chapter 19 follows the structure of the PRA report. The sections of Chapter 19 correspond to the chapter in the PRA report. The structure of the PRA report for AP1000 follows the structure of the PRA report for AP600. That gives us an introduction section followed by several system description sections. Then it gets to the meat of the risk assessment. Each facet of the review is covered

in a separate section.

Next slide, please. Before I get much further, I would like to point out that when we say PRA we are not necessarily talking about the same thing. For some people PRA means the internal events computer model.

To some people it means the report or the analyses as a collection that allow us to modify risk. To other people it's the stack of pages for which this report is documented. It's in that last sense of the term that we expected Westinghouse to provide the PRA at the time they did their initial design certification.

Part 52 has changed since then. They are no longer require -- a DCD applicant doesn't have to submit the PRA but instead are expected to describe the PRA and report the results in the DCD or FSAR. We had some challenges because the AP1000 is a little of this and little of that the amendment having come in after the change to Part 52. One of the big issues in several of the OIs related to the issue of what needs to be described in the DCD or is there an alternative way of putting that new information on the docket.

To quickly give you an overview of all

these 59 sections, a lot of them are not full of much content. When you go to look at the DCD it will say something like this was previously considered by the staff so we are not going to talk about it again. That is because it was discussed in the PRA report.

It's a section that hasn't changed and so for the amendment Westinghouse didn't really need to tell us anything more. Those will be very short and sweet and Bellefonte's COL simply says we incorporate that by reference. We have pointers to pointers that point back to the PRA.

There have been some changes since AP600 in the information that was required and that is why some of the chapters are no longer used. Then there are sections that are system description material. The only DCD Chapter 19 they mainly point to whatever section of the DCD actually has the system description.

Next slide, please. The remaining 11 sections are the ones we actually looked at. Our slide shows that we have six open items total for AP1000. This is an accounting error on our part. One of these, the 19.58, refers to an open item about high winds during modes five and six with a draindown condition. We received a response satisfactory to the

staff and we now consider it a confirmatory item. Otherwise we match up perfectly.

Next slide. I'm going to try to talk more about how the staff went about its review than what is in the PRA. I'll focus on our objective which was to confirm that our original conclusion in the FSER is still valid. The AP1000 is significantly safer than the current generation of plants.

In order to reach that conclusion we felt we needed to see how the PRA upgrade was done and how PRA was updated to reflect the various design changes in this amendment. We wanted to make sure that the insights were properly captured so that they are protected as future changes are considered.

We wanted to make sure that the scope of the D-RAP, which relies in part on the PRA, was still appropriate. There are various things that are touched by the result of the PRA, the ITAAC, D-RAP scope, Tech Specs. All of those were brought into conformance with the PRA as it is today.

The things we focused on were the changes. Since we aren't reviewing the whole PRA it's often a little confusing how we end up with such a narrow scope for a DCD. The other thing that was very important in the review was the PRA audit. We went to

Westinghouse's office and we took a look at various things I'll talk about in more detail soon.

Seismic risk remains a big issue. Bret Tegler is here from the branch that deals with those so if there are areas where my understanding is lacking, he'll be able to answer your questions. The issue of the description of the PRA and report of results that goes into DCD is going to turn up again and again.

In Section 24, Severe Accident Phenomena Treatment, our issue has to do with radiation. Westinghouse has satisfied us that they have a path forward for dealing with consequences of a hydrogen burn. The equipment hasn't changed since the certified design. What did change is that the larger fraction of the core is released into containment. This caused us to feel we needed to take another look. I think we have another slide on this later. COL Application is incorporated into the DCD by reference.

The main issues on seismic have to do with the hardrock high-frequency sites where there is an exceedance of the acceleration at particular frequencies above the certified design seismic response factor. There are some other issues, though, too. The shield building design has been modified and

we are not confident that the impact of this modification on the HCLPF for the shield building has been resolved.

In going from the fortified resign where external events were left to the COL applicant to resolve to the current amendment where Westinghouse is trying to envelope all sites, we now have some other issues related to soil structure interaction. Where the hardrock high-frequency sites got looked at more closely before, now we have implications at frequencies that might be important for other components at some of the other COLs. Not an issue for Bellefonte.

CHAIRMAN RAY: Malcolm, stop right there would you, please. Elaborate on this change that you just mentioned. You said the change to 52 was to require the DCD to address on an enveloping basis external events whereas previously that had been left to the COL applicant. Is that correct?

MR. PATTERSON: I'm sorry. I misspoke if that is the impression I conveyed. Part 52 doesn't require this generic approach. It was a choice by the AP1000 group, Westinghouse and its licensees or the COLs who take this approach to simplify the process of applying for a COL. If the COLs can -- I'll get to

this briefly in the next slide.

Let's just go ahead to the next slide.

CHAIRMAN RAY: All right. It was the nexus between that change and what I understood you to say which is a change to Part 52 that I was asking about.

MR. PATTERSON: The change to Part 52 is about where is the PRA information coming to the NRC. Is it coming in the form of an AP1000 PRA report or is it coming in the form of something in the DCD that gives us a description of the PRA and the results of the PRA. The results of the PRA to us are much more of point estimate of CDF than a point estimate if the LERF.

We think that the insides are important. We think the sequences are dominant is important knowing the contribution of the important sequences relatively speaking which SSCs are the ones that contribute most to risk, cutlets as well as sequences. There is a lot of information that was used by the staff to draw the conclusion that is in the FSER.

Would you like to have that same level of information to be able to assert that conclusion is still true. That is the Part 52 part. The generic site part is just a strategic decision to simplify the

licensing process by having a generic site that is subject to so much challenge that all of the COLs will be able to say, "I'm bounded by that site."

MR. CUMMINS: This is Ed Cummins. "I'm bounded by that Westinghouse PRA."

MR. PATTERSON: It's kind of a standardization thing that helps our customers and helps us because a new customer coming in as already assessed all these site-specific things like wind and rain and maybe seismic. At some places it might get so difficult that it's not practical to do it.

CHAIRMAN RAY: Well, I'm just mulling all of that and recognizing that seismic has interaction as mentioned. There are a number of elements. Some might be better at some sites and some elements might be worse at those sites and how are those traded off when you are getting to the PRA so that you can say I'm still enveloped by the results. Things like that is what I'm thinking about but I don't want to divert the discussion.

MR. PATTERSON: We can come back to that. I don't have many more slides so I have plenty of time for questions.

CHAIRMAN RAY: Fair enough. Go ahead.

MR. PATTERSON: The decision to do this

happened fairly recently and the result was by the time the Bellefonte application came in there wasn't a whole lot of time between the staff saying, "Your approach is acceptable to us," this generic site, and Bellefonte making it's initial application.

Consequently, all the initial application said was for Section 19.58 "incorporate by reference." There was no basis for us to say we have seen that your site is, indeed, within the generic site.

MEMBER BANERJEE: Can I just ask you a question about PRAs of general interest to me? We had a flood in France in one of these plants. Right? Did the PRAs for that plant show up as far as things that actually happened?

MR. PATTERSON: I'm sorry. I don't have any information on that. Is there anyone else on the staff here who can --

MEMBER BANERJEE: It's a nice thing to do but I'm just wondering is there some validation of what you find in reality?

MR. PATTERSON: I'd be very interested in seeing it but I think in the case of AP1000 PRA it's unlikely because the basic approach at AP1000 is to make external flooding something that can't happen.

MEMBER BANERJEE: Would you do away with

the event?

MR. PATTERSON: No. By providing design features that prevent the intrusion of water and looking at the various ways external floods can affect the plant ensuring that the grade level is nominally 100 feet in a DCD. Of course, it's different in every plant but they can tie it to that 100-foot level.

By making sure there is always some reasonable margin between the maximum level of water, probable maximum precipitation and the confluence of various flooding events means that you don't get to see the kind of analysis you're talking about. We get to see a little bit of it in the internal flooding analysis but that's only looking at part of the plant getting flooded at a time.

MEMBER BANERJEE: In that case why are we interested in floods?

MR. PATTERSON: We have to make sure that those external slides always stay below the 100-foot level. Otherwise, we are in uncharted territory. If any flood could be identified that did that then --

MEMBER BANERJEE: It's an issue of the maximum flood.

MR. PATTERSON: Right. It's different from site to site. For example, at Levy County they

will be most concerned about storm surge and hurricanes. At Bellefonte that is not the primary concern.

The method that Westinghouse and its licensees used was to collect information from each site about what their external events -- what challenges their external events offered, the frequency and the severity. By selecting the ones that were worst, they felt all they would have to do is say "we're bounded."

When the staff said, "Incorporated by reference isn't enough information. Please tell us more," they came back with a standard supplement for the COL saying, "We've looked at it and we're bounded." The staff felt that wasn't enough information for us to confirm their data so we asked them to provide specifics on the various tornados, the various categories that had been observed in a reasonable area around the site. Same thing for hurricanes, the basis for the flooding. Often these analyses were already performed for other parts of the DCD but --

CHAIRMAN RAY: I was going to say aren't you replicating what you're describing in the context of PRA what takes place elsewhere?

MR. PATTERSON: Yes, but the important issue for us was Chapter 19 is supposed to address the risk from these things, the contribution to core damage and LERF, not what is the magnitude and have you designed against that particular external challenge. While you have deterministic analysis saying your plant withstands these things, we need risk characterization.

CHAIRMAN RAY: I understand that. What I'm really struggling with is your use of the word "bounding" and I'm trying to figure out the context in which you are discussing it, is that the same bounding as you talk about in the deterministic?

MR. PATTERSON: No. That's only one part of it. For us we had to know not only that there was no event of greater consequence but also that events of similar consequence were not of greater frequency, the dimensions that we look at.

CHAIRMAN RAY: I do understand the difference between PRA deterministic so you use the word bounding and I'm trying to think what does that really translate into?

MR. PATTERSON: Less frequent and not as severe, or no more frequent and no more severe.

CHAIRMAN RAY: Both.

MR. PATTERSON: Both.

CONSULTANT KRESS: Do you add up multiple events?

MR. PATTERSON: Yes, in several senses. For example, for probable maximum precipitation you don't look at one rainfall. You look at, well, what if you've had a series of rains that are --

CONSULTANT KRESS: So you add them up.

MR. PATTERSON: Yes. And they will also combine things like, "Okay, if we have the probable maximum precipitation when it more likely to have a dam failure. If you have upstream dams, it will be looked at in a different context from one thing at a time. There is a Reg. Guide that tells you which things need to be combined to provide yourself confidence in looking at events at 10 to the minus 6. That is an important point to raise, though.

The basis for screening COL from doing more PRA was if you could show that you are within the generic PRA you don't have to do anymore. The way we screen external events for the DCD and the way we would have done it for COLs if the external events had been evaluated by the COLs is we look at the core damage frequency and we predict overall.

We are trying to draw the conclusion that

these plants are safer than the current generation of plants but with external events it doesn't matter how much safer you make the internal PRA. You haven't done much to make the plant really safer.

Where this is a 10 to the minus 7, 10 to the minus 6 plant, we expected them to show us that the frequency of an initiating event that was within our universe of external events was no more than 10 to the minus 7. If the event was that rare, it was unlikely to contribute to CDF to the point where it would affect our conclusions.

Alternatively if an event was more probable than 10 to the minus 7 and no more probably than 10 to the minus 6, then we would look at the consequences if the event. When you are looking at those events it's likely that you will be able to show that the consequences are less than 10 to the minus 8.

You can add up an awful lot of those without having any significant impact on your conclusions about the safety of the plant. Those are the three screening criteria from the COLs. If they are bounded, they can stop. If it's so rare we don't care, they can stop. If it's consequences are so low we don't care, they can stop.

Otherwise, they need to address it in

their risk assessment. In nearly every case I expect that we'll be screening these things out by one category or another but it was for the COLs to demonstrate that for us.

That's why we had a round of supplemental RAIs and that's why we had plant-specific responses from each plant saying, "My tornado frequency is..." Or, "My high-wind frequency is..." "My maximum flood is..." We can then make a comparison looking at the analysis, making sure it matches the other chapters, and then we can say, "Yes, we agree."

CONSULTANT KRESS: Just stop at LRF as a criteria or do you --

MR. PATTERSON: CDF and --

CONSULTANT KRESS: Yes. You do a Level 3 only in what, Chapter 3?

MR. PATTERSON: A Level 3 PRA is now performed in the environmental report.

CONSULTANT KRESS: That's Chapter 3.

MR. PATTERSON: That is a different part of the COL. It's no longer in the FSAR.

CONSULTANT KRESS: Oh, I see.

MR. PATTERSON: Next slide, please.

MEMBER BANERJEE: Going back to how an applicant may demonstrate it, is it primarily based on

a combination of historical data and analysis?

MR. PATTERSON: Yes.

MEMBER BANERJEE: Otherwise when you are looking at 10 to the minus 7 you are getting two things which are getting close to the age of the Earth or something. How do you --

MR. PATTERSON: They are very old.

MEMBER BANERJEE: Actually, minus 9 is the age of the Earth. Right?

MR. PATTERSON: Nick, you want to address this?

Let me introduce Nick Saltos. He did the assessment of the external events technical report.

MEMBER BANERJEE: It could be ice ages. It could be all sorts of things.

MR. SALTOS: This is nick Saltos. As Malcolm said before, we are looking at the frequency. If the frequency of the initiating event or an event is less than 10 to the minus 7, we're still up there because by examining those events we know they don't take it to core damage so we have order of magnitude at least so the CDF will be less than 10 to the minus 8 which is two orders of magnitude less than the base CDF of the plant.

MEMBER BANERJEE: How do you come up with

numbers like 10 to the minus 8 or 10 to the minus 7?

MR. SALTOS: We have reviewed the PRA before and we know where the risk comes from. We know the accidents consist with the cutlets so --

MEMBER BANERJEE: I know the methodology. I'm just skeptical about the numbers.

MR. SALTOS: What numbers, the frequency?

MEMBER BANERJEE: Ten to the minus 7.

MR. SALTOS: Okay. Ten to the minus 7 there are some events that historically you can say they are extremely rare or because of physics are impossible.

CONSULTANT KRESS: Take a transportation spill of some toxic material or something.

MR. SALTOS: Yes.

CONSULTANT KRESS: How do you arrive at the frequency of that?

MR. SALTOS: It depends how -- where the --

CONSULTANT KRESS: It's never happened near the plant.

MR. SALTOS: Yes. What the transportation routes are, how far from the plant. Even if it happens, we're talking about the frequency of an accident that caused the potential to damage the

plant. We're not talking about any kind of accidents far away from the plant. Because of physics you know this is -- we don't know the exact frequency but we know that it is almost impossible so less than 10 to the minus 7 inn some cases.

CONSULTANT KRESS: I still wonder how you get --

MR. SALTOS: But in additional to that, even if the frequency is higher, we know then you have to do some semi-qualitative analysis and find out that the CDF, the steel, that is more. We screened out the extended events based on these two criteria, the frequency of the event and also the small CDF.

MEMBER BANERJEE: Perhaps I'm taking it too literally. This is a way to reassure yourself but in reality the Earth changes within this period.

MR. PATTERSON: Let me offer two examples. One would be flooding where we know certain floods have a certain probability because we have observed them. We can model this and extend our belief about what we know about the frequency of floods a little beyond that. Then we can combine multiple different sources of flooding that have independent failure probabilities or dependent failure probabilities and we can model that.

By combining them we can say, "All right. This flood is around 10 to the minus 6 and it leaves us seven feet below the grade. Obviously a flood that is going to give me seven feet more water is less frequent. I can't tell you exactly how much less frequent but I'm prepared to believe that it's more than an order of magnitude. That is the kind of argument that we --

MEMBER BANERJEE: I can see it in a relative sense. I think the way of explaining it is good but in an absolute sense I don't think it has any meaning because --

CONSULTANT KRESS: It's doesn't matter that the Earth has changed over the time frame or the situation. This is a frequency that you apply at that moment based on whatever. It doesn't matter what --

MEMBER BANERJEE: Let's say there is global warming and the sea level changes by several feet or something. At some point it's going to change.

MR. PATTERSON: We're not talking about license renewal.

MEMBER BANERJEE: That's 50 years from now. Anyway, thanks. I think I've got the point.

MR. PATTERSON: Okay. In Section 19.59,

the results and insights, the biggest changes, of course, were design changes to the I&C systems. We were a little disappointed. We would have really like it if Westinghouse had gone ahead and converted all of their old I&C systems to new software. Then we could look at before and after.

Conversion is a tremendous amount of work and full of its own traps so their decision made sense to us. They converted the easy part and then they built new fault trees. I'll talk about the things we looked at in the audit but we didn't get any surprises from the revised fault trees. This was a very, very important change because you're talking about systems that probably contribute -- are probably the most important systems in the plant with respect to risk, the protection system. The control system is probably the most important non-safety system.

There were a number of changes to reactor coolant pumps. Westinghouse tried to include pumps that were not canned motor. They also moved the heat exchanger from internal to the pump to an external heat exchanger. Those evaluations we got to see. We are also making changes to the flywheel. I think that tech report is soon to be out.

MR. CUMMINS: This is Ed Cummins. We

talked about this yesterday.

MR. PATTERSON: In any case, the point I would like to make is we haven't looked at that yet but we have looked at the way Westinghouse looks at that. Since we are focused on changes, we could be satisfied about the changes that we got to see. We are also very concerned about the changes that Westinghouse continues to make. One of the things we looked at in the audit was their process for evaluating changes. I'll talk more about that subject.

This focus on change is not just the changes that are made but also the process for managing change and making sure that the PRA is tightly in the loop so that we don't lose control of our risk assessment.

We also looked at the reactor vessel insulation system. This is the only system that our group actually evaluated but, again, we were only looking at changes. We identified in the certified design that it was very important to make sure that the characteristic of the outside surface of the vessel was maintained so that heat transfer there was very good. We went around a few times making sure that there were no coatings or wrappings or anything

that might interfere with that.

CONSULTANT KRESS: Can I ask you a question about that? This is the external cooling to prevent so you keep the vessel melt in-vessel. Right?

MR. PATTERSON: We used to think of the reactor vessel insulation system as something that wrapped right around the vessel or in contact with it. The Westinghouse design provides a channel around the vessel.

CONSULTANT KRESS: For the flow to go up and blow and cool the outside of the vessel?

MR. PATTERSON: Exactly.

CONSULTANT KRESS: The tests that were done by Theofanus, I guess, it didn't have insulation.

MR. PATTERSON: My understanding -- well, I've looked at test results that had a slightly different configuration from the currently proposed design and --

CONSULTANT KRESS: If it is an in-depth thing anyway, I'm not sure you would even include it in the PRA.

MR. PATTERSON: A severe action issue, yes.

CONSULTANT KRESS: Yes. It's ruled out on the basis of low probability, I think, by using the

ROAAM process. My concern is you have a cylindrical head and you are trying to force flow up through it so you get bowling at the right places and heat transfer that you keep the melt from melting through.

Well, my experience with cylindrical things that you try to flow up through, it's awfully hard to control the flow distribution. I don't know if Sanjoy agrees or not but I expect you might get, especially when it's natural convention driven which this is, that distribution may be such that you could have hot spots on this thing and naturally melt through the hot spots.

All the tests I'm familiar with were more or less two-dimensional instead of three-dimensional. I don't know how you assure yourself that this thing is actually going to work. Or is it necessary to do that since it's a defensive in-depth thing anyway, I think?

MR. PATTERSON: I think it's necessary for us to do that but I didn't try to because we had already approved the reactor vessel insulation system in one form. What we were looking at were the changes that had been proposed in this one. For example, at the bottom of the annulus through which the water flows, there used to be a valve that was kind of like

a snorkel float like a ping pong ball that will lift it.

Now Westinghouse has replaced that with a flapping door. The door has buoyancy and it's hinged. We looked at issues like how much force does it take to open that door and what are our concerns about the hinge getting stuck and how often are they checking and what kind of maintenance gets done on this so we can have confidence that if needed it's available. By focusing on that little change we didn't have the hard question to answer this time.

CONSULTANT KRESS: It's that kind of thing that makes me worry about floating.

MR. PATTERSON: But we didn't look at that this time.

MEMBER BANERJEE: Why did they change that? Maybe I should ask Westinghouse.

MR. CUMMINS: This is Ed Cummins again. We had a conceptual design at the time of the AP1000. We knew the size of the plenum we needed and the velocity of water but we didn't have the support structure and how you mounted this is a little bit complicated.

You have to mount the insulation system off the wall, not from the reactor vessel and how do

you get water in the most effective way. We did a detailed design that was required by a COL open item for the reactor vessel insulation and the results of all that is this detailed design which we did change the float valve method. There's a bunch of supports there now. I think even the steam exhaust up into the loop compartment is also slightly different but they are engineered now so it's a more designed complete product.

MEMBER BANERJEE: Now it's a door that flaps open?

MR. CUMMINS: Buoyancy lifts the door and then it has kind of an off-center thing at the center of gravity. The float falls down into a place where it's nice for the curvature.

MR. PATTERSON: All right. We focused on PRA configuration controls during design. In fact, this was an area where we requested some additional information. We thought that the screening criteria that Westinghouse was using was a little too simple. They would put something in that would look at whether this can affect the PRA.

If and only if the SSC in question was explicitly modeled in the PRA and we wanted them to look at other changes they might make, even changes to

operating procedures which could have an impact. For example, the one we identified and drew our attention to this was the vacuum fill system.

We have certain assumptions about the position of the valves that go into the PRA and when the system is configured for vacuum fill, those valves are repositioned. They are not consistent with PRA.

We're not saying that is necessarily a safety issue but it is something that needs to be considered and should kick that kind of modification into review by someone from the PRA point of view. They have made changes to their procedures so that they do take a broader view of the PRA review. I think you guys have completed everything since 17.

MR. ANDERSON: Rick Anderson again, PRA. Everything from DCD 16 through 17. We had agreed that we would look again at the 15 to 16 group as we started our plant specific PRA work.

MR. PATTERSON: In other words, these are things that have already undergone review by people with a fair amount of experience in PRA and decided they probably didn't affect the PRA much but they agreed to take another look at them from a different perspective. We think that will obviate any concern we might have.

From the COL applicants we got a supplement that tells us how they will maintain the PRA after they get their license. At that point it will be their responsibility, not Westinghouse's.

Next slide. And to tell you about what we did in the PRA audit -- this is my last slide -- we wanted to get to see what their conversion process actually looked like and what the new fault trees looked like because those have not yet appeared on the docket. It was a new model but we can see very clearly how they had transferred from the old software to the new software. We got to look at the new fault trees.

I would say there was one useful conclusion from modeling the digital INC. In the previous design Control Room multiplexing had a common cause failure mode that was quite significant. That has been eliminated from the design. You might say that is a PRA insight.

I don't think that's what drove the design decision but it does show up in the model and it's one of those things that we think should show up in the reported results. This thing that used to be very significant is no longer a concern. We evaluated their procedures for --

MEMBER BROWN: You shouldn't have told me that. Multiplexing absolutely sucks when it comes to feeding data to a protection. It's got to be one of the worse design decisions anybody has ever made. It destroys your determinacy.

MR. PATTERSON: Fixed.

MEMBER BROWN: I just had to say that. Get my oar in the water -- and independence.

MR. PATTERSON: We evaluated how the design process integrated with PRA review and we got to take a look at the qualifications, their program for determining who is expert enough to put on the expert panel and who is expert enough to participate in various levels of review.

The most interesting thing was we got to see their Corrective Action Program in action. As it happened, Marie Pohida sort of did the regulatory thing and put her finger right on a data point that hadn't gotten correctly transferred from the data source in the PRA model and Westinghouse took the appropriate actions.

We got to see how they went about initiating corrective actions and we've gotten periodic reports of the status of evaluating the extent of the condition as well as their schedule for

getting the PRA redone with this particular problem resolved. That's all I have to present.

CONSULTANT KRESS: Let me ask you a question. Back when I was doing this stuff we thought there was going to be a problem with the staff. You had to go to headquarters of Westinghouse and you had to take a bunch of your staff with you. You sit down in a room and go through all the fault trees.

MR. PATTERSON: We were only there a week.

CONSULTANT KRESS: Just wondering how long did it take.

MR. CUMMINS: It's a nice place.

CONSULTANT KRESS: The other option, while we're talking about this, you actually get the PRA here and looked at it but did you find this process satisfactory and you can do your job that way pretty well?

MR. PATTERSON: I guess that's a policy decision that's been made but I would point out that the reason our reviewer could basically go to the right fault tree and look for the right data is because we already knew where to look and that is because we spent a lot of time with the PRA. If this were a new design I'm not sure how it would be done. From the other design centers that will be a

challenge.

CONSULTANT KRESS: I had a question about the PRA problem, the shutdown. Did you benefit from just a couple of high-risk configurations?

MR. ANDERSON: The shutdown PRA looks at drained and non-drained conditions. It brings in a lot of the models from the at-power PRA to support it. There's a lot there.

CONSULTANT KRESS: The question I have about this you have determined the amount of time in similar conditions. Where did you get that information from? What did you base it on?

MR. ANDERSON: We base it on what our outage coordinators are predicting. And. in fact, we have done an availability prediction for the plant based on PRA techniques that pretty much match up with the predictions they are making.

CHAIRMAN RAY: Malcolm, you referred several times to a finding that I recognize as being based in, I guess, an SRM. Anyway, Commission level direction about these plants being safer than the existing plants. Is that the extent of your aim? Is that what you are seeking to do ultimately or is there anything else that you are striving to do in this Chapter 19 review?

MR. PATTERSON: That is the finding that drives us but I have to say that over the course of AP600 through two generations of AP1000 we have gained a lot of very useful insights. There have been design changes that Westinghouse has made because their model informs them of risks that need to be controlled. Components that have been changed from non-safety related to safety related because of the PRA.

CHAIRMAN RAY: No doubt that is true and I acknowledge that but I'm just looking at it from a standpoint if I'm an applicant coming in for a COL with an AP1000, I would say I've got worse flooding conditions. I don't envelope.

I got worse environmental external events, a whole variety of them. But with all these changes to the PRA I meet the same standard which is a qualitative judgment. End of story. Is that the end of the story or if they have more frequent events, let's say, for example.

I'm speaking now to the deterministic findings that are required but just sticking with PRA alone. What difference does it make if it's still a really safe plant even though it's on a site that is not as safe as the DCD assumed

MR. PATTERSON: I would have to say that I

don't think it matters because --

CHAIRMAN RAY: I didn't think it mattered either.

MR. PATTERSON: -- if Westinghouse had not volunteered to do this generic-bounding site, it would be left for each COL to come up with their own numbers and it would be for the Commission to decide on the merits of each application whether or not that site --

CONSULTANT KRESS: In a simplistic view of is it safer than existing plants might be that CDF is the order of 10 to the minus 5 and LRF is order of 10 to the minus 6? Would that be a sufficiency?

MR. PATTERSON: That wasn't the design goal for this particular design.

CONSULTANT KRESS: It's in the Utility Requirements Document.

MR. PATTERSON: Clearly some of the other plant designs are making that argument. They have a right to apply and I think they would pass the test.

CHAIRMAN RAY: Okay. Well, obviously I'm trying to figure out what the applicability of this is to out deliberation and it seems to me like it is the finding that you said was your aim. There are opportunities for insights, no doubt, that make it worthwhile digging into the details and doing all that

can be done. The bottom line remains that the plant is significantly safer than existing plants and that seems to be the acceptance criteria that at least I'm aware of. I'm just mulling what the implications of that may be.

All right. Anything else then from the staff?

MS. McKENNA: I would like to make a comment. It was noted that one of the open items has to do with the aircraft impact assessment and at the time that the chapter was issued staff had not performed its review of that part of the analysis. As you may know, the rule just became effective, I think, yesterday. Staff does plan to do an inspection of the information that Westinghouse prepared as part of their aircraft impact assessment. We would then include that information in the final SER.

MEMBER BANERJEE: We don't see it before the final SER?

MS. McKENNA: It's something we can certainly discuss as to whether there is value in having a briefing on that topic. I think staff first needs to go and see what there is to see and we can certainly --

MEMBER BANERJEE: When will you do that?

MS. McKENNA: I'll turn it to Brian Thomas. I think he's here. Yes.

MR. THOMAS: Brian Thomas, Branch Chief, Structural Engineering. The plan is to get up and start inspections to determine compliance with the rule which, as Eileen said, just became effective. That plan is to have that done. At least the current thinking is within this calendar year, at least for the AP1000. Maybe earlier but that is the range. The time frame we are thinking about is somewhere by the end of September through the end of the calendar year.

CHAIRMAN RAY: I'm not familiar -- that's a good point but I'm not familiar enough with the exact wording here. Is that in anyway going to bring about a different standard than I just talked about with Malcolm in which the real question is, well, at the end of the day even now considering malevolent aircraft impact, there is no special vulnerability here in this plant to aircraft impact and, therefore, it remains well below existing plants, end of story, or is there more story there?

MS. McKENNA: Again, I'm not sure how to quantify. This was kind of mentioned earlier that in this area the probabilistic aspect is very hard to deal with. I think the idea was that there is a

particular hazard that was put worth to the applicant to look at how their design would respond to that and it was selected based on whatever considerations the folks who designed that had. If it then survived that particular hazard through the robustness of the design and whatever other design features they might have, that would satisfy the intent of the rule.

CHAIRMAN RAY: Well, I understand but survive in this case, I would imagine, is relative to existing plant designs, not relative to some absolute standard.

MR. THOMAS: Let me deal with the question. As was said earlier, there is no PRA in the aircraft impact design whatsoever. It's all beyond design basis. Now, it looks at physical deterministic approaches, very accident scenarios that can occur. It looks at potential points of impact on the facility. Then it really gets into an evaluation and methodology. It gets into an evaluation of the robustness of the design. It looks at whether or not containment remains intact. If not, if there is damage to the core if you in anyway impact your heat removal capability.

CHAIRMAN RAY: So it's just attached in this location and the application. It really isn't

relevant to --

MS. McKENNA: I think it was a convenient place to put it.

MR. CUMMINS: This is Ed Cummins. From an industry standpoint it's important to the industry that we treat this as beyond-design basis because you have different acceptance criteria. The difference between Chapter 15 and 19 would be a huge thing to NEI and the industry.

CHAIRMAN RAY: Right. This preserves that perspective.

MR. CUMMINS: Yes. Right.

PARTICIPANT: Mr. Chairman, on the COL side of the house there is also a portion of Chapter 19 that is not complete dealing with recently promulgated rule on Part 73, larger area fires and explosions. Similarly on the COL side there is a portion of Chapter 19 that is just starting. The staff is just beginning to review that information.

MEMBER BANERJEE: At the moment the plan is we'll see it in the SER but why weren't they briefing us before that?

PARTICIPANT: Understand and we'll be happy to do that when we have material to present.

MS. McKENNA: Obviously that would be a

closed briefing because of some of the nature of the information.

CHAIRMAN RAY: All right. Anything more from the staff or the applicant on this Chapter 19?

MS. SANDERS: That concludes our presentation.

CHAIRMAN RAY: All right. Thank you very much. It happens that we've ended right almost precisely on time but we are ahead of schedule actually by virtue of having done Chapter 19 before lunch. We'll take up Chapter 4 immediately after lunch at 1:00.

(Whereupon, the above-entitled matter went off the record at 12:02 p.m.)

A-F-T-E-R-N-O-O-N S-E-S-S-I-O-N

1:00 P.M.

CHAIRMAN RAY: Back on the record and resume, please, with Chapter 4 and we'll finish the day when we're done with that with a review of Chapter 16. We'll start now with Chapter 4 and Mr. Sisk.

MR. SISK: Thank you, Mr. Chairman. Chapter 4 is an overview of the fuel core design and reactor materials. This chapter describes the mechanical components of the reactor core including such things as fuel rod, fuel assembly, nuclear design, thermal hydraulics materials, and the function of Reactivity Control System.

With regard to the significant changes or major changes made to Chapter 4, we did an update to the gray rod design from the certified design going from a silver indium cadmium type to a 12 basically spreading the rod -- I should say -- I drew a blank. Excuse me. The rod worth across the fuel a little bit flatter.

We revised the burnable absorber rod design to include both Wet Burnable Absorber and borosilicate. We had an inconsistency where we referenced one kind in one part of the report, another kind in the other. Quite frankly it was either/or and

we needed to get the report to be consistent.

We also added material for the CRDM to increase the flexibility on the materials we would use. The reactor internal material specifications also adding some material and we had to address an issue on the soluble boron credit analysis and the report referenced in the DCD had to be changed out.

CHAIRMAN RAY: Is there a succinct description of the load capability that these gray rods provide, if any?

MR. SISK: There is. Again, we are not so much using it for load following as much as power flattening. Let me turn that to Bob Fetterman and he can give a very succinct description.

CHAIRMAN RAY: There is some material that talks about load following.

MR. SISK: Yes.

MR. FETTERMAN: There is a brief description --

CHAIRMAN RAY: Identify yourself.

MR. FETTERMAN: My name is Bob Fetterman, Westinghouse. There is a brief description that is given in the DCD of the load following capability of the plant but if you wish for more information, I can provide that.

CHAIRMAN RAY: Just a minute or something.

MR. CUMMINS: Ed Cummins. The nominal one is 100 percent for 10 hours, two hours down to 50 percent, 10 hours at 50 percent, and two hours back to 100 percent but the nominal one is just a nominal one. You can take many other ones.

CHAIRMAN RAY: That's fine. And you had some turbine bypass capability I suppose that you can put on top of that?

MR. CUMMINS: Yes, we have 40 percent turbine bypass.

MEMBER ABDEL-KHALIK: But the gray rods are not primarily for load following. What is the primary function of the gray rods, primary seal offset control?

MR. FETTERMAN: No. The primary function of the gray rods is for reactivity or moderate temperature control. Instead of making fine changes to soluble boron concentration many times a day, we used the gray rods to perform that function instead.

CHAIRMAN RAY: Which then gives the load following capability. Okay, Rob. Before you go onto your next slide, describe what the changes were. Could you say a little bit about why?

MR. SISK: Well, as related to the first

one with the gray rod, the Rev. 15, the gray rod design is 24 rodless which four in Rev. 15 were silver indium cadmium. For a better distribution of the rod worth throughout we went from four to 12 so it's just a general improvement, if you will, in the --

CHAIRMAN RAY: You weren't trying to enhance the performance in some way like we were just discussing, for example?

MR. SISK: Well, it does enhance the core performance, core operating performance. Bob Fetterman again from the nuclear design, I think, much prefers to have a flat arc of distribution of the rod worth. I'll let Bob speak.

MR. FETTERMAN: It provides a significant reduction in the change of the pin-by-pin power distribution within the assembly when the gray rod is moving if the absorber is spread out more uniformly.

CHAIRMAN RAY: It may not be what you aim was but in this day and age of grid integration problems it's a real advantage, I think, to have that capability depending on what it is. I just wondered if it was driven by that or by some other consideration.

MR. SISK: Operational flexibility and, again, flatter --

CHAIRMAN RAY: When you are trying to integrate an increasing problem these days is integration of intermittent resources in the grid, for example. It occurs to me this is an advantage in that regard and I just wondered if it was a motivation. It doesn't sound like it was.

MEMBER ABDEL-KHALIK: Are all the gray rods in one bank?

MR. SISK: No, sir.

MEMBER ABDEL-KHALIK: They are in different banks?

MR. SISK: Distributed across the core.

MEMBER ABDEL-KHALIK: Right. Which bank would that be?

MR. FETTERMAN: There are four different banks of gray rods. There are a total of 16 gray rod cluster assemblies divided evenly into four separate banks and they are labeled MA through MD.

MEMBER ABDEL-KHALIK: Thank you.

CHAIRMAN RAY: Go ahead and just give us a quick word on the other changes and what motivated them.

MR. SISK: The next change was simply a clarification between the use of wet annular burnable

absorbers commonly referred to as WABAs, and borosilicate glass. We had an inconsistency in the DCD in which both of them were referenced at one place or another and approved because of the nature of the DCD and this is one of those areas where we are cleaning it up.

We wanted to have consistency. We just simply put both in so it's "or" and it basically covers it all. The third item, the CRDM material changes, was primarily, again, adding a little bit of flexibility.

MEMBER BANERJEE: What did you change it to?

MR. SISK: I'm sorry?

MEMBER BANERJEE: You said CRDM material changes.

MR. SISK: We had -- let me refer to Dale here because he'll get the material better than I will.

MR. WISEMAN: This is Dale Wiseman from Westinghouse. In Rev. 15 for the pressure boundary material for the CRDM there were only two materials listed, 304 and 316, both LN grades. What we added were the 304 and 304L, 316 and 316L as acceptable materials pressure boundary. That was the change in

the DCD.

MEMBER BANERJEE: That was an addition.

MR. WISEMAN: It was additions of acceptable materials. The current design of the pressure boundary is LN.

MEMBER BANERJEE: What motivated that change?

MR. WISEMAN: The motivation was that at the time we hadn't done all the detail design work and there was some question about availability of the LN grades so we wanted to make sure that we had acceptable materials with the staff in case we couldn't get the material.

CHAIRMAN RAY: Reactor internals?

MR. SISK: Very much the same as the CRD in material changes. Again, it was an addition of materials, not much more than that. Then the soluble boron credit analysis, the original Rev. 15, had a topical report that has been subsequently rejected by the staff that we needed to redevelop the soluble boron credit analysis. In fact, that is one of the open items where we are working with the staff to get to resolution on.

MEMBER ABDEL-KHALIK: I guess we'll hear

more from the staff as to the underlying reason for rejecting the methodology?

MR. FORSATY: My name is Fred Forsaty.

CHAIRMAN RAY: I mean --

MR. FORSATY: Later on. Okay.

MR. SISK: So, generally speaking, that is Chapter 4 in terms of the changes. We do have two open items. One, we had to address the Reg. Guide for the CRD and material canopy. COL material we talked about that to resolve the soluble boron credit methodology with the staff.

MEMBER BANERJEE: Sorry, go back to that canopy COL.

MR. SISK: Yes, sir. Need to address the use of Rev. Guide 1.44 and CRD and canopy COL. I think that has a limitation on -- Dale.

MR. WISEMAN: This is Dale Wiseman. This open item is really a request from the staff to include some of our design features in the text of the DCD and the fact that we apply Reg. Guide 144 to this material. We have reached agreement on what needs to be put into the DCD and, in fact, recently we have just submitted a response to the RAI that shows the changes that we would add.

MEMBER BANERJEE: But they haven't

accepted it yet.

MR. WISEMAN: No, I don't think we've had a response.

MEMBER BANERJEE: That's why it's an open item.

MR. WISEMAN: Correct. Pending the resolution with the staff.

CHAIRMAN RAY: All right. Eddie.

MR. GRANT: Yes, sir. Again, Chapter 4. As you might expect, again Chapter 4 contents match up with the DCD. Also, as you might expect, the applicant doesn't have a whole lot to do with core design. As such, we really just incorporated by reference the entire chapter except for one COL item which is to confirm the assumptions of the safety analysis DMVR limits. However, we really can't do that until we have the final instruments identified and in place and have identified the uncertainties associated with those instruments.

That subsequently then would be a post-COL item "as-built" type information. That has been proposed as a license condition to be completed in that time frame. We provided no additional information on the fuel since it's entirely within the scope of the DCD and we have no open items.

MEMBER BANERJEE: So the placement of the instrumentation and so on is not completely specified?

MR. GRANT: It is. I should probably let them talk. They know where they are going to put the instruments. It's a matter of --

MEMBER BANERJEE: Verification or what?

MR. GRANT: We expect certain uncertainties but the final instruments depending on what's available at the time could be slightly different and we want to make absolutely certain that those match up with the instrument uncertainties that were used in the DMVR limit analysis so we'll check those. It should be just a quick check to make sure they match up and, if they do, we're ready to go.

MEMBER BANERJEE: You have some instrumentation brands or whatever, specific instrumentation specified at the moment. Don't you?

MR. SISK: We have what the specification requirements are for the uncertainty of the instrumentation. This is Rob Sisk, Westinghouse. This is an item that was actually in the certified design as well as this design as an action item that as we procured the instrumentation that we confirmed that the uncertainty of the instrumentation meets the assumptions and meets the analysis to support the

system design. I think the action here was just to really verify that the instrumentations are procured are consistent with the assumptions.

MEMBER BANERJEE: There is no change to the fuel or anything compared to the original certified design?

MR. SISK: No. This is simply a matter of confirming the uncertainties to support the DMVR calculations.

MEMBER ABDEL-KHALIK: From an AOA standpoint is this considered the high-duty index core? I asked that question yesterday --

MR. SISK: You did and I deferred it --

MEMBER ABDEL-KHALIK: -- and we will again today.

MR. SISK: Excuse me. You did and I deferred it to when our core designer could come in and discuss it.

MR. FETTERMAN: This is Bob Fetterman again from Westinghouse. As far as high duty it's consistent with several other currently operating plants out there today so I wouldn't say it's in excess of where we have operating experience as far as duty. It's not one of the very low-duty plants but it's also not excessive in that regard. It sits

pretty much consistent with today's operating plants.

MEMBER ABDEL-KHALIK: The plants that are within the same range of duty index, are they experiencing axial offset anomaly?

MR. FETTERMAN: Not lately, no. Not since plants have been more cautious on their coolant chemistry as far as cleaning up and also with the implementation of a zinc injection system that has done quite a bit to reduce the risk of that AOA.

CHAIRMAN RAY: All right. Anything else? Dave, will you begin or Phyllis or who?

MR. JAFFE: I will. My name is Dave Jaffe with the AP1000 licensing branch. This is the presentation for Chapter 4 of the design certification amendment in Bellefonte COL application. Phyllis Clark is project manager for this chapter of the AP1000 design certification amendment review. She could not be here with us today. I'm filling in for her.

We have Ravi Joshi who is the project manager for Chapter 4 of the Bellefonte COL application. With the technical staff we have Neil Ray from the Component Integrity Performance and Testing Branch. We have Gene Hsii and Fred Forsaty. As you can see from the next slide the AP1000 DCA

review has two open items and none for the Bellefonte COL.

Now I'll turn the presentation over to Gene Hsii.

MR. HSII: My name is Gene Hsii again. I'm a reviewer of Reactor Systems Branch. I'll talk about the next slide and changes to gray rod assemblies. I think a lot of stuff I'm going to talk about Bob already mentioned it.

Basically the gray rod assembly revert to the radioactivity control assembly similar to the other control assembly. The mechanical design of interface between the radar assembly and the CREM and the pre-assembly are similar to the RCCA but --

CHAIRMAN RAY: Similar to what?

MR. HSII: Similar to RCCA, reactor contained assembly. But unlike RCCA, are not part of the --

MEMBER ABDEL-KHALIK: Can you say that again, please?

MR. HSII: They are not reactor protection system.

MEMBER ABDEL-KHALIK: Okay.

MR. HSII: They are not used for the other

trip.

MEMBER BROWN: Okay. They are not used for protection from an analysis standpoint but are they driven in or dropped? If you have a trip, they go in. Right?

MR. HSII: Yes.

MEMBER BROWN: All right. But they are not factored into the analysis demonstrating protection for whatever the particular accident is. I just wanted to clarify that to make sure we didn't have rods hanging around.

MR. HSII: The AP1000 design have 53 RCCAs and 16 gray rod assembly as Bob mentioned before. The gray rod assembly have 24 rodlets. In the recent trip only four of them are. The rest of them -- the other 20 are stainless steel. Instead of 17 they change it to the increased number of absorber containing 12 of them with the other 12 stainless steel.

The change of this design, as Bob mentioned before, is to provide a more uniform absorber distribution within the fuel assembly. It does not affect -- it does not create a modeling condition for safety analysis so we don't think there is an affect on Chapter 15 analysis and result.

MEMBER BANERJEE: It could have been

better.

MEMBER ABDEL-KHALIK: What is the total worth of the gray rod?

MR. SISK: In both cases the worth didn't change but let me, again, defer to Bob for the total worth.

MR. FETTERMAN: Bob Fetterman from Westinghouse again. The total worth of 16 gray rods is worth approximately 1 percent delta rho when they are inserted in the core.

MEMBER ABDEL-KHALIK: Thank you.

MR. HSII: Okay. The next I'm going to talk about is the borosilicate glass burnable absorber. This burnable absorber is used for power distribution control to achieve an acceptable negative moderate temperature coefficient. Because of the burnable absorber rods can reduce the burn concentration the AP1000 design has about 1,500 burnable absorber rods.

As Bob mentioned awhile ago, in Chapter 15 WABA is what is used for this form of absorber. In the recent 17 addition actually changed the final design to Pyrex burnable absorber, Pyrex borosilicate glass burnable absorber.

MEMBER BANERJEE: Was the wet annular

burnable absorber also boron?

MR. SISK: It is boron but it's a different configuration.

MR. HSII: The Pyrex burnable absorber has been used by Westinghouse for a long time. The topical report was in the 1960s.

MEMBER ABDEL-KHALIK: If I may just go back to the previous slide, the gray rods are used for essentially what you told me is fine control of boron concentration rather than sort of using dilution.

MR. FETTERMAN: Yes. Fine control of temperature reactivity so boron concentration can remain constant for a certain interval of time and reactivity can be controlled by motion of the gray rods.

MEMBER ABDEL-KHALIK: Right, but a 1,000 pcm, which you just told me, is worth 100 pbm boron so is there some kind of time at which these rods are pulled all out and then you start all over again?

MR. FETTERMAN: Yes, yes. For base load type of operation you would change the soluble boron concentration on the order of about once every one to two weeks. This depends on the amount of gray rod assertion that you would have.

Typically for a base load operation you

would have one gray bank fully in and a second one partially inserted and that amount of insertion would be enough operation for about one week or so without changing the boron concentration. As you operate gray rod would move as a function of time to compensate for fuel depletion. Once it reaches a certain interval of withdrawal, you change boron to bring the gray rods back in and continue operating like that periodically through the cycle.

MEMBER ABDEL-KHALIK: I'm just sort of curious about how quickly or how slowly you need to move the gray rods to account for either fuel depletion or accumulation of fission products.

MR. FETTERMAN: During base load operations the gray rods would probably move on the order of about 20 steps a day so --

MEMBER ABDEL-KHALIK: Out of a total of 228?

MR. FETTERMAN: Two hundred and sixty-four. You would probably move them on the order of maybe five times a day four or five steps at a time. The motion is dictated by the rod control system so it is receiving input signals for moderate temperature and it's going to see that and decide it has to move the gray rods to keep the T_{ave} on its program and

gradually step during the day. It's not going to be large amounts each time. It's going to be a little bit each time to keep in the program.

MEMBER ABDEL-KHALIK: When you get to the point where they are inserted deep in the core, eventually you have to pull them back out because they don't carry you all the way through the cycle.

MR. FETTERMAN: That is correct. When you are depleting the core and reactivity is decreasing as a function of time you would change the soluble boron, as I said, to get, say, the first gray bank fully inserted and then the second one about a third to a half OAN.

Keep that boron concentration constant as a function of time and allow the gray banks to gradually back their way out of core via T_{ave} control in the rod control system. It will continue to gradually withdraw the gray banks and then at a certain point where they are nearly out of core the operator can change the soluble boron concentration and bring the gray rods back in.

MEMBER ABDEL-KHALIK: So how much does T_{ave} change when you insert that extra boron that allows you to gradually change to pull the rods?

MR. FETTERMAN: I believe the T_{ave} program

is about 1.5 degree dead band, about a full-power target. It's going to fluctuate about 1.5 degrees. Once you get to one end of the band or the other, then the gray rod will move to compensate.

MEMBER ABDEL-KHALIK: All right. Thank you.

CHAIRMAN RAY: Again, on my interest, is there some change to the control system or anything else that would be required in order to achieve load following that Ed described?

MR. FETTERMAN: Other than you go in and specify the target of axial offset that you want to maintain during the load follow. The idea is you would be able to go with the load follow very easily from base operation and be able to follow the load transient as a function of time.

CHAIRMAN RAY: Good. Again, would it require a design change or a licensing change to do that?

MR. FETTERMAN: No.

CHAIRMAN RAY: All right.

MR. HSII: The AP1000 initial core design operation parameter design for the first cycle was especially in Chapter 4.3 table, 4.3-1 and -2. If they change it, we've got to review it to prove it.

For AP1000 core parameters like power distribution and shutdown margin all similar core design when there is this Pyrex burnable absorber so this change is acceptable.

The next topic I'm going to talk about is the deletion of COL items 4.2-1, 4.3-1, and 4.4-1. COL items require COL applicants to address changes to reference design of fuel, BA rods, RCCA, or initial core design from DCD.

In Revision 17 Westinghouse proposed to delete the item. Actually in the respective section it just says this issue is unresolved. In Table 1.8.6.2 there is a COL item and that item is deleted. The reason is personnel has actually submitted a technical report to describe the change from the Revision 16 to whatever it is now. Those changes already included in Revision 17 now.

The reason we think this deletion is okay is because when those new design features are included in Revision 17, that become a core design again so the fuel design parameters all are identical as a Tier 2 star information. Any change to this design from DCD we are to review and approve. We think this item is redundant. It's covered by a Tier 2 star so we think it's okay to delete.

MR. FORSATY: My name is Fred Forsaty. I'm the reviewer of Section 4.4-3, nuclear design. On this change basically the DCD revision 16 has to do with the boron criticality calculation. Revision 16 references WCAP-14416. This WCAP in 2001 was under staff review. The staff concluded at that time that the axial burn-up calculation is basically not conservative and could impact the boron criticality calculation.

We at the same time concluded that non-conservatism in the burn-up and the impact on the boron calculation is not that significant. The methodology contains other conservatism that there would be no safety impact or safety issue at that time to use that methodology. However, we informed Westinghouse in 2001 that Westinghouse may wish to consider advising this topical report and resolve or correct this problem with the boron criticality calculation. That's for Revision 16.

When Revision 17 was submitted to NRC Westinghouse submitted a new analysis, a new methodology that supposedly would correct the deficiency in the previous methodology. That methodology right now is under review and they would inform ACRS with the result as it becomes available.

CHAIRMAN RAY: Well, we've made this comment before. I guess we are not wanting to focus on what is the difference between 17 and 16. It's not clear to me what the difference is between 17 and 15 which is what we do care about.

MR. FORSATY: Are you talking about the difference in methodology that was submitted in 16 and 17?

CHAIRMAN RAY: I'm trying to figure out what is being done to change the certified design which is 15.

MR. FORSATY: We'll give you a little more detail on the deficiency. The deficiency basically overestimates the actual burn-up distribution.

CHAIRMAN RAY: Does it apply to 15?

MR. CUMMINS: Maybe I could help. This is Ed Cummins. In Chapter 15 we had a spent fuel pool design that was designed for 10 years. We had COL open items to perform criticality analysis and structural analysis of the racks. We didn't really certify a design there.

Since then interacting with our customers we changed the fuel rack design to be a two-region fuel rack design with a capacity of 18 years. We provided a structural analysis to close the one

structural analysis open item and we provided actually now two different criticality analyses to try to close the criticality analysis. In this case what was certified was the size of the pool, not much more than that.

CHAIRMAN RAY: Okay. Well, it's really not, I don't think, material what the problems were with the Revision 16 that was proposed. What's before us is Revision 17. I gather from what Ed just said that it's under review?

MR. FORSATY: Yes, it is under review.

CHAIRMAN RAY: We don't need to worry about what the problems were in Revision 16 because I don't think it's material to what we are here to consider.

MR. FORSATY: That's correct.

CHAIRMAN RAY: All right. Thank you.

MR. HSII: This is Gene Hsii again. On the next slide the change of COL information in item 4.4-2. In DCD Revision 15 the COL in Information Item 4.4-2 specified COL applicant to calculate instrumentation uncertainties of operating plant parameters and design limit DNBR using revised thermal design procedure to confirm the validity of the DCD design limit DNBR. In Revision 17 there is a change

to COL applicant's item, COL holder's item to perform the same calculation prior to COL.

MEMBER BANERJEE: What is the revised thermal design?

MR. HSII: The revised thermal design procedure is the procedure that in the safety analysis you can do the diminished method or statistical method. The DNBR from the correlation -- when you do that analysis you assume operating parameter, in the worse condition, the limiting condition so the penalty is too high. Rather than doing the diminished method the uncertainties associated with the operating parameters are included in the DNBR limit.

MEMBER BANERJEE: Do they go from originally just pushing all the parameters to their worst values to a more statistical method now?

MR. HSII: In this method you don't use the analysis. You just assume nominal value because uncertainty associated is already included in the new method, new DNBR.

MEMBER BANERJEE: The question really is in this Revision 17 they go to the revised procedure or did they already have --

MR. HSII: It's already --

MEMBER BANERJEE: Already 15 was approved

MR. HSII: Yes, it's already approved. The only difference between 17 and 15 is applicant's information item, the COL holder information item so it's a timing difference.

MEMBER BANERJEE: Sorry, I missed that. I'm not getting --

CHAIRMAN RAY: It's a holder item.

MS. McKENNA: Let me give it a try, Gene. This is kind of a generic theme you may have heard on other topics where in Rev. 15 there were a lot of these COL items that just the COL applicant will do something. Now that the COL applicants are having to do those things, they are finding that in some cases there are things they can do now and include in their application and get them taken care of.

There are other cases where, and this is an example, where there is something that has to happen in the future so these items have to carry forward into being something that the COL licensee will do so the DCD changes in these areas is really just on the terminology of saying the COL applicant to the COL holder. We have a number of these that you may have seen.

MEMBER BANERJEE: Okay. So what you are really saying is this becomes the responsibility of

the COL holder to do.

MR. HSII: That's right.

MS. McKENNA: Right.

MEMBER BANERJEE: At the time when they stop -- just before they operate the time for whenever it is.

MR. HSII: The method. It does not change the method. The only change is the timing from the distribution, the change from COL applicant to COL holder. We think this is acceptable because you cannot tell the uncertainty of instrumentation.

MEMBER BANERJEE: I understand. That's fine.

MEMBER ABDEL-KHALIK: Section 4.4 in general deals with thermal hydraulic design.

MR. HSII: That's right.

MEMBER ABDEL-KHALIK: Has the inclusion of this flow skirt or the addition of this flow skirt been included in the thermal hydraulic design?

MR. HSII: Yes. When they made a change in the flow skirt put some neutron pad on the thermal shield we request Westinghouse to do an evaluation because we think the flow skirt is going to increase the resistance so we ask them to do an evaluation of Chapter 15. We didn't ask them to do the whole

analysis. We just asked them to do the limited cases to see what is the effect on the DNBR, the end result.

MEMBER ABDEL-KHALIK: My concern is about normal operation thermal hydraulic conditions. How did the addition of this flow skirt affect the input for VIPER and how did you come up with that?

MR. SISK: Let me just say at this point we did have an expert come in to talk about the flow skirt based on yesterday's conversation. He is currently sitting at the Metro station trying to get here. They had an accident on the red line.

CHAIRMAN RAY: Again?

MR. SISK: One person this time. He is held up. If he does get here a little bit later on, we can revisit that if we could. He was following up on the flow skirt question from yesterday and should be here shortly.

CHAIRMAN RAY: Okay.

MR. RAVI: Okay. Gene wants to go to COL items which is on slide 30 because they are tied to each other.

CHAIRMAN RAY: We'll come back to this item.

MR. RAVI: He's going to go forward to slide 30 which is tied to this one also.

MR. HSII: I'm going to jump to slide 13. That is a standard COL item. There is a STD COL 4.4-2 that is essentially the COL item in DCD. They proposed in Part 10 of the summary propose that as a licensing condition so we think that is acceptable.

MR. RAVI: Now remember just now he said the other item became a COL holder item. Now the COL holder is saying that become a license condition. That is basically the change.

MEMBER BROWN: Who is responsible for the accident analysis, Westinghouse or the COL, for the core that you've got designed for this?

MR. SISK: Chapter 15? Westinghouse.

MEMBER BROWN: But you did the analysis?

MR. SISK: Yes, sir.

MEMBER BROWN: The analysis already has instrument error assumptions in it. Doesn't it?

MR. SISK: Assumptions. Yes, sir.

MEMBER BROWN: Don't your technical specs or whatever it is then require instrumentation detectors, etc., to be procured within those boundaries so if you buy instrumentation it's within those specifications that are equal to or better? Why do you have to do more analysis?

MR. SISK: That is actually the point

being made here is exactly that point but we still have to confirm that the instrumentation that ultimately is procured is within the assumptions of the analysis.

MEMBER BROWN: Okay. All right. I just didn't get the picture. I thought there was something additional. This is strictly focusing on the hardware you buy and making sure it meets the tech spec or whatever the assumptions. Okay. I got that. Thank you.

MEMBER BANERJEE: The question that is on the table is the effect of the flow skirt. I noticed he walked in.

CHAIRMAN RAY: It's timely, I think, to take advantage of the arrival of our expert here. If you will please identify yourself and then we can address the question to you.

MR. TRAY: My name is Suma Tray. I'm the Director of Fuel Reactor Field Engineering which has everything to do with the core and the fuel hardware. I assume the question is regarding the flow skirt.

MEMBER ABDEL-KHALIK: How did the presence of the flow skirt affect the VIPER analysis, the VIPER input?

MR. TRAY: What the intent of the flow

skirt is is to even out the flow distribution that comes to the bottom of the core. What we are really concerning ourselves with is the mal-distributions that can happen in the flow. Now, there are two things that we look for. If the flow is too low, you get flow starvation and we worry about that. If the flow is too high, we worry about the fuel drive vibration which is proportional to the flow velocity.

The real basis of the analysis for the flow skirt was CFD analysis so what we did was a very thorough flow dynamics analysis which kind of validated that the flow skirt was going to give a much more uniform flow distribution inlet into the core. We've been doing testing in Japan as we speak. It's a 1:7 scale flow testing to validate the assumptions of the CFD. At this point --

MEMBER BANERJEE: Did you say validate assumptions?

MR. TRAY: Yes. Validate the results of the CFD.

MEMBER BANERJEE: You were doing a CFD simulation of these tests?

MR. TRAY: Exactly. Yes.

MEMBER BANERJEE: But these tests are not designed on the basis of similitude so they can be

used directly? CFD has to be used as your scaling tool?

MR. TRAY: These test is used as a validation of the CFD analysis.

MEMBER BANERJEE: What's the Reynolds number scaling?

MR. TRAY: Typically the Reynolds number we have in the reactor is about 500,000 for an average fuel assembly. What we do in these tests basically is try to reproduce on a 1:7 scale the internals, the lower internals, the downcomers, and exactly what kind of flow distributions we would get with the flow skirt on. What we are doing the tests are -- we are at the point where we've got preliminary results and the results are coming out quite favorable with the CFD analysis.

What we really look for is are we getting the evenness and flow distribution that are within our design assumptions. The VIPER analysis, to go back to it, has certain assumptions about how much flow you can starve an assembly. As long as we are within those bounds, we are fine.

MEMBER BANERJEE: When you say 1:7 scale, it's 1:7 scale in diameter?

MR. TRAY: Yes.

MEMBER BANERJEE: Okay. That's the 1:7 scale.

MR. TRAY: Right.

MEMBER BANERJEE: The whole sizes and everything of the skirt are full-scale?

MR. TRAY: Yes. If you sort of scale only the diameter is the height scaled down? How is the scaling done?

MR. WISEMAN: This is Dale Wiseman.

MEMBER BANERJEE: Are we going to go into closed session on that? Is there any proprietary information?

CHAIRMAN RAY: No, I don't think so.

MR. WISEMAN: The geometry is 1:7. All the geometry. The height, the hole sizes, they are one 1:7 scale. We do run at full velocity.

MEMBER BANERJEE: Yes, but then the jet Reynolds numbers are down so the mixing -- the scaling of the mixing is very difficult. I didn't realize that the hole sizes were down. The velocities through the holes are then not scaled? Your Reynolds numbers are basically 1:7 or whatever?

MR. WISEMAN: There is also a temperature effect in there because we are running at lower than reactor temperature.

MEMBER BANERJEE: We had better take a look at this also.

CHAIRMAN RAY: Okay. So a request is to make sure that it's clear to the applicant. I don't know if the staff has any comment on the request we are making here or information about this test that Professor Banerjee is asking about.

MEMBER BANERJEE: And the sort of scaling methodology that you're using to go from these tests full scale. If, for example, on full scale you find that predictions were not completely correct, do you have a way to adjust things then or are you stuck with what you get?

MR. WISEMAN: This is Dale Wiseman again. The approach here is that we will have the test data. We'll have CFD analysis of the test model. Then we'll have CFD analysis of the full scale.

MEMBER BANERJEE: Suppose it turns out that when you actually operate the reactor that there was something wrong with the safety analysis. What is your strategy to deal with that? Let's assume the worst that the safety analysis didn't do a good job.

MR. TRAY: Dale, I can take that. What we do typically, like I said, the reason for looking at the flow distribution is two things. One is to look

at the DNB analysis and how the safety analysis behaves with the mal-distribution.

The second thing is to make sure what we do in terms of our fuel rod vibration and making sure we do not get too much wear is bounded. What we do typically is when we develop our fuel assemblies we develop them to flow rates which are much higher. All we need to do is to validate that the bounds and the changes that we get are within that envelope.

The second thing is on the safety analysis. If the flow distributions do turn out to be a lot lower, we can apply a DNB penalty. We always have margin which we keep which would offset any impact to the flow distribution. One important thing to understand is the flow distribution, when you have the corporate jets and you have the jetting, there is a very quick equalization of the flow.

There is cross flow early on and the DNB zone really does not start until much higher in the core. Typically if you have a 10 percent mal-distribution, the impact of that on a DNBR may be around the order of 1 percent. The first kind of margins usually we have much more than that needed to cover these kind of penalties.

MEMBER BANERJEE: Why did you need the

skirt anyway in that case?

MR. TRAY: I think the main reason for our skirt is not just safety analysis but also to make sure that mechanically no fuel assembly gets much more flow than typically we would like it to have. That is the margin we add to make sure we do not have fuel failures because we have vibrational issues with too much flow.

MEMBER BANERJEE: So if the skirt didn't work as you planned, I'm really asking you whether there is a way to deal with the problem if the skirt is still less effective or more effective.

CONSULTANT KRESS: How would you know?

MEMBER BANERJEE: The fuel damage.

CONSULTANT KRESS: We go all the way to fuel damage before you find out?

MEMBER BANERJEE: Maybe the core instrumentation would tell them something.

CONSULTANT KRESS: I don't think they have enough of that.

MR. CUMMINS: This is Ed Cummins with a history lesson. We didn't really invent the flow skirt. We copied somebody else who did this.

MEMBER BANERJEE: That's reassuring.

MR. CUMMINS: Whatever. Combustion

Engineering had issues at Palo Verde relative to inlet flow and they didn't have this flow skirt and they invented it at the time and we have adapted it. It's not exactly the same but it's the same idea as what they did. That was a big deal. It's a big change.

We could change the flow skirt. It's welded to the bottom of the vessel. It's not something you want to do but you could have a new flow skirt or change the size of the holes in the flow skirts, or even change the size of the holes in the bottom support plate where you didn't have enough. The problem is can you really analyze what effect it has and do the codes really help you. Different experts say different things about that.

CONSULTANT KRESS: Do you have to have the skirt because you have a two-loop system instead of four?

MR. CUMMINS: No. It had nothing to do with the loop so it does have to do with where the internal lugs that you mount the internals are and the structures in the bottom of the core plenum where you have all the instruments that came up there. Now we have a couple kind of support plate devices. Those all have an impact on the flow distribution.

MEMBER ABDEL-KHALIK: We were told

yesterday that near the periphery of the core without the skirt the flow is roughly 65 percent of average or nominal and that the skirt tends to equalize that up to 75 percent or something like that?

MR. TRAY: Those are the numbers that off the top of my head I don't have.

MEMBER ABDEL-KHALIK: The assumptions for the VIPER calculations is that you have a 10 percent deviation from the inlet flow?

MR. TRAY: The inlet flow in the peak assembly, in the hot assembly.

MEMBER ABDEL-KHALIK: It's sort of out of thin air.

MR. TRAY: That is typically something which we have traditionally done in our analysis dating back to whenever we've been doing DNB analysis. What we've had in the older designs, again, is very similar, 1:7 scale test which I've looked at what the true flow distributions are.

MEMBER ABDEL-KHALIK: Have you sort of explored all the possible sort of potential core designs like ring of fire or something like that that would place the hot assembly closer to the edge of the core?

MR. TRAY: Yes, we have. The ring of fire

type assemblies will typically, for those who don't know it, the hot assemblies would be in a ring maybe two rows in-bard or one row in-board from the periphery. We have looked at all of the different potential distributions you could have.

Once again, the thing to realize about DNB is that you have a lot of flow equalization that goes on because it's open channels and PWRs. By the time you get to the DNB zone, which is typically at least mid-point in the assembly for more transient accident conditions, that flow distribution is very well neutralized. We look at all of these things but the impact by the time you get to the DNB zone it's fairly dampened a lot because the cross flows have equalized and you have fully developed flow and equalized flow.

MEMBER ABDEL-KHALIK: And you do have a limit on cross flow to prevent excessive wear or fretting of the rods.

MR. TRAY: Absolutely. We do testing to also validate how much cross flow is tolerable for testing.

MEMBER ABDEL-KHALIK: So without the skirt are you above that limit for cross flow?

MR. TRAY: I think the skirt -- the way I would call it is that without the skirt we would feel

that we would have lower margins than what we otherwise would have. The AP1000 fuel assembly we designed for significantly higher flow tolerance than typically would be with a AP1000 reactor.

We think with the skirt we get much more margin. For us everything is about margin. It's margins that you get to wear. It's margins that you get to DNB and that is what we really tried to shoot for. Let's try to get as even a flow distribution as possible. That way we'll be sure.

CONSULTANT KRESS: That margin calculated would be a lot less than current operating PWRs?

MR. TRAY: Margin. Are you talking about safety analysis?

CONSULTANT KRESS: DNBR.

MR. TRAY: No. The AP1000 is designed with a 15 percent terminal margin and that is part of our overall analysis. There is 15 percent terminal margin built in over and above what our safety limits are required to be. That is typically what I would say is more than what we have in many of our existing reactors equivalent to maybe some of our existing reactors but certainly not less.

MEMBER BANERJEE: I'm trying to figure out how the skirt works without having seen it.

MR. TRAY: Maybe Dale can be a little bit better with it.

MEMBER BANERJEE: Let me give you what I think how it works and then tell me if I'm wrong or right. That's the easiest way. Basically most of the flow goes through the holes in the

MR. TRAY: The core jets.

MEMBER BANERJEE: No. I mean, the skirt is --

MR. TRAY: Yes.

MEMBER BANERJEE: Therefore, you make a series of horizontal jets with a certain stopping distance. Because it has a limited stopping distance, it gives you, therefore, a flow which is more uniform in the plenum. More or less this is how it works.

MR. TRAY: That's what I would --

MEMBER BANERJEE: Okay. So it depends now on the penetration difference, the distance of these jets. What you're saying is that when you have a 1:7 scale that somehow the penetration distance was scaled to 1:7 in rough terms. This is really the issue. It depends whether the jets are turbulent, what instructors there are. It's not an easy issue I can see. Okay.

CHAIRMAN RAY: All right. Do we have a

request for information here?

MEMBER BANERJEE: I think so.

CHAIRMAN RAY: Eileen.

MS. McKENNA: Yes. Would you phrase the request?

CHAIRMAN RAY: Capture this clearly enough. Do you understand what we're asking for?

MEMBER BANERJEE: If they have anything written up about the tests and the results and the CFG methodology you're using, which I presume -- I was told it was CFX. You're probably using a Capsolon model with it or some RANS? Are you using the round Reynolds model?

MR. TRAY: I don't think we used CFX. I think we used Star-CD but they are equivalent.

MEMBER BANERJEE: They are coming from the same antecedents.

MR. TRAY: Dale, you might know better. Do we use Star-CD?

MR. WISEMAN: This is Dale Wiseman. The original CFD analysis used CFX. We have now moved -- for the analysis of the test and for the scaling part of it we've moved to Star-CD.

MEMBER BANERJEE: That's fine. Tell us what models you're using and how you've activated

them. You're not doing an LES. You're just doing a RAN, Reynolds averaged.

CONSULTANT KRESS: I didn't catch what the flow was. Did the flow scale down to 1:7?

MEMBER BANERJEE: Yes. Everything is scaled to 1:7.

CONSULTANT KRESS: Even the flow rate?

MR. WISEMAN: Yes.

MEMBER ABDEL-KHALIK: Let me just get this clear. It's geometrically scaled to 1:7 but are they dynamically similar? Are the Reynolds numbers the same?

MR. WISEMAN: They are geometrically similar experiments but they are not dynamically similar experiments.

MEMBER BANERJEE: Because he's kept the velocity the same so the Reynolds number has to go down to 1:7.

MR. WISEMAN: Right. This is the same approach that Westinghouse did on all its new reactors, the standard 3-loop plants and 4-loop plants was a seven scale test of similar nature. Actually we are getting more data now than we did in the past.

MEMBER BROWN: And you used CFD tools to do the scaling before or you just used --

MR. WISEMAN: When we were doing the CFD I wasn't around.

MEMBER BROWN: Spalding's code PHOENIX was wrong.

MEMBER ABDEL-KHALIK: But isn't there sort of a leap of faith in this process in a sense that even if your CFD code, or even if your 1:7 scale experiments at the lower Reynolds number are exactly matched by the CFD code, what guarantee do you have that the CFD code will do equally well at seven times the Reynolds number?

MR. WISEMAN: Reynolds number effects are an issue and we need to address those.

MEMBER BANERJEE: Anyway, I think the real situation is you probably have seen some experience using this skirt before.

MR. WISEMAN: Right.

MR. CUMMINS: This is Ed Cummins. Before in history we always do seven scale tests but we have mostly been concerned about effects on the reactor internals for vibration and other things. In this case we are mostly interested in flow distribution. It's a little bit different concern.

I would reinforce something that Sumit said. We are trying to maximize the margin we have

because this is an area where there is some lack of certainty of what you really have. No matter what we do in terms of testing and analysis there will still be residual uncertainty. If we reduce that, then we help ourselves and our customers.

MEMBER BANERJEE: In the meantime you put a flow resistance in order to distribute the flow better so that has an effect on the flow.

CONSULTANT KRESS: Normally you would put that resistance at the other end to even out the flow.

MR. CUMMINS: Ed Cummins. I don't think so. I think if you want to even out the flow at the inlet you put the flow resistance at the inlet and, in fact, the support plate does a nice job of it but it didn't meet the fuel criteria by CFT analysis anyway so we needed to do something.

CONSULTANT KRESS: I'm still at a loss to know how you are going to know what the effect is unless you actually look at the full size of the reactor.

MR. CUMMINS: You don't know because we don't measure the flow. But you do know if you have fuel damage because right angle or cross flow.

MR. TRAY: The other thing is if you get an extremely -- if you extreme mal-distribution, then

the core outlet thermocouples can pick up.

CONSULTANT KRESS: Yes, you have enough advance warning.

MR. TRAY: But you need to have an extreme level of mal-distribution. Otherwise, the flow neutralizes and equalizes.

MEMBER ABDEL-KHALIK: There is no way that the core exit thermocouples --

MR. TRAY: You have to have really -- I mean, in some plants we had flow anomalies and sometimes the core exit thermocouples can pick up the changes if you have unstable core distribution. I think it's very hard unless it's extreme.

MEMBER BANERJEE: If the main effect is on fretting damage, then you'll see it in fuel damage. As he says, by the time it gets to the place where the DNB is critical, it's probably even --

CONSULTANT KRESS: I believe that.

CHAIRMAN RAY: All right. One more time, anything more you want to say?

MEMBER ABDEL-KHALIK: No, I don't.

CHAIRMAN RAY: We have to direct this to the staff over here.

MEMBER BANERJEE: If we get the information, I think that's fine.

MR. JAFFE: The staff will now address the reactor materials Section 4.5. Neil Ray will make the presentation.

MR. RAY: Good afternoon. I'm Neil Ray. I'm the Acting Branch Chief of this branch. However, during this presentation I have only two slides. It won't take much time. If you have any questions, I have my colleagues who will definitely be more than happy to answer your questions.

Essentially what happened is in the AP1000 Westinghouse added some more materials in 304, 304L, 316 and 316L just to have much more flexibility with materials and so on and so forth. When we got it the problem was really because, as you know, the PWRs the SCC is a concern when there is high oxygen content. Typically Westinghouse don't have high oxygen content but with this new material the problem we faced is what is the carbon content and the sensitivity of those things.

So we asked that question and, as you can see, there is an open item. Then Westinghouse responded by saying specifically that they are going to use additional material. They are going to use Reg. Guide 1.44 which describes how to avoid sensitized material.

They also are going to use Reg. Guide 1.37 in terms of environment. Most importantly, they changed their design so there is no stagnant water which may cause the oxygen content to be higher. With that, staff reviewed this thing and it is now acceptable to us.

MEMBER BANERJEE: Also I noticed you reduced the number of welds.

MR. RAY: Yes, they reduced the number of welds also.

The other subject is the reactor internals and core support materials. Here also they added some new materials for the same reason. In this particular case most of the materials they used, or they proposed to use, are being used in the current reactors and we have pretty good experience with them. One major issue was the additional 304H but they found carbon content is not going to exceed 0.08 percent.

The most important thing you may or may not be aware of it which NRC and industry are dealing with it at this very moment, which is called MRP program. That is the IASCC concern of the reactor internals. What happened is very briefly when you have a very high cumulative clearance, typically greater than 10 to 21 neutron percent squared, then

there is a potential of having hard soil and packing.

To address that thing what Westinghouse did in AP1000, first of all, they modified there because nothing new was there. Additional neutron pairs which will reduce the neutron to heat the core. I mean, the internals. And also the vessel as well.

They submitted a WCAP for the -- actually, that was done for current PWRs, current Westinghouse plant, the WCAP-16620, where using the guidelines and the lead of the MRP they came up with a matrix which basically says the stress level is your cumulative plan.

If you can maintain within that matrix, then you don't have any concern for void swelling or SCC. In the AP1000 case they proved that for up to 60 years that we'll be within that matrix so there should not be any concern about SCC and, hence, they don't need to do any additional inspection.

CHAIRMAN RAY: Questions? All right.

MR. RAVI: The remaining portion of the presentation is related to the COL Chapter 4 and you can see from the slide the entire section is actually IBR except standard COL in 4.4-2. I believe Gene actually talked about the slide No. 13 previously so if you have anymore questions on that particular

slide, I think Gene can take it. Otherwise, our presentation is complete.

MEMBER BANERJEE: I think we may revisit this afternoon the issues with the skirt at some point. I mean, we should digest that information in more detail. Is that okay with you, Harold?

CHAIRMAN RAY: Sure.

MEMBER BANERJEE: That's the main difference.

CHAIRMAN RAY: Take note on that, would you, Tom and Mike.

Anything now from the staff on Chapter 4 for members? All right. Recognizing that there are people in the audience who would like as much margin to their transportation as possible, rather than take a break now we'll at least see how far we get in Chapter 16 by 3:00 before we take a break. Let's see if we can pick up on Chapter 16.

Okay. We are on with Chapter 16 now and proceeding as before. Rob.

MR. SISK: Thank you, Mr. Chairman. I would like to introduce Don Behnke, the licensing lead for Chapter 16.

MR. BEHNKE: The subject matter experts that are here to support this discussion are Chip

Suggs and Chuck Brockhoff. Chapter 16 describes the generic technical specifications and investment protection.

The changes in Chapter 16 are more driven by other changes than they are by changes specific to the tech specs. A lot of the changes associated with the tech spec changes were bracketed items so they were dealt with in the DCD as opposed to in the COLA applications. That's the first bullet.

The second bullet is associated with the design change as I mentioned. A couple of examples are revising of stroke times for valve requirements. The stroke times were revised due to manufacturing limitations such as motor size and actuator size. As a result of those changes, there were associated changes in the tech specs.

Another example of a design change is gray rod swap and operational requirements consistent with the use of the online power distribution monitoring system. That removed the gray rods from the shutdown margin calculation. We had to have the tech spec set up so that we could do gray rod swaps without entering an action statement.

The last bullet there is associated with the generic impacts to the technical specifications

such as TSTFs or tech spec task force items. An example of that would be TSTF 449 which is associated with generic letter 0601 which has to do with steam generator tube integrity and the impacts to the inspection program.

Moving on to the next slide.

CHAIRMAN RAY: Are the tech specs at all affected by the resolution of DAC, design acceptance criteria?

MR. BEHNKE: Not to my knowledge.

CHAIRMAN RAY: The tech specs can be written completely and satisfactorily based on the DAC itself, not how the DAC gets resolved by the final design?

MR. CUMMINS: Ed Cummins. I think the tech specs really are functional. That is, you get a trip on high pressurized or level. How the INC processed it is not in the tech specs.

CHAIRMAN RAY: I understand. I was thinking more of tech specs that would be design dependent where the design wasn't finished but there aren't any of that kind it sounds like.

MR. CUMMINS: Yes. There is an existing DAC which we hope to close on piping which are design dependent and there the ITAACs say there is an ASME

code report for the "as-built" piping arrangement.

CHAIRMAN RAY: All right.

MR. BEHNKE: Moving on to the open items. There are ten open items and I'll go through all of them. The first one is associated with revised equations for OTdT and OPdT setpoints. We were able to improve the equations based on the instrument RTD resistance to temperature so the delta T more represents the core power. This open item is associated with providing the justification for that change either in the DCD or in a subsequent report.

The next one has to do with measuring RCS flow using RCS flow elements in addition to the calorimetric heat balance. It's the same kind of thing with respect to providing justification for that addition.

MEMBER BANERJEE: What do you mean flow elements? What are these flow elements?

MR. BEHNKE: I believe they are elbow taps. Correct?

MEMBER BANERJEE: They are what?

MR. BROCKOFF: This is Chuck Brockoff. They represent elbow taps that we used to measure differential pressures that indicate flow in that particular loop.

MEMBER BANERJEE: Where are these taps put?

MR. BROCKOFF: They are in the reactor coolant system loop. We would use those as an indication of the flow.

MEMBER BANERJEE: Measure the pressure loss at the elbow?

MR. BROCKOFF: Around the bend in the piping, yes.

MEMBER BANERJEE: Wherever.

MR. BROCKOFF: Yes.

MEMBER BANERJEE: Do you calibrate this for a k factor or something?

MR. BROCKOFF: We do extensive startup testing to measure the differential pressures and do initial flow testing as our baseline. I'm not sure of the details of how we factor that in but we have testing we do for pre-operational testing that forms our baseline and the intention is to implement this measure periodically to compare against that baseline. We have actually implemented this on one plant, I believe in South Texas, except that was implemented after the fact so they didn't have the original baseline data that we would get for our plant.

MEMBER BANERJEE: As the plant evolves in

time the roughness and things like that change in deposition. How does that affect the pressure loss measurements?

MR. BROCKOFF: Well, we would see that as a reduction in the flow over time. The other thing we do, this doesn't replace. This is an alternative to the current methodology they use which is do a precise calorimetric, divide it by delta T and some up with flow measurement.

MEMBER BANERJEE: That I understand.

MR. BROCKOFF: Okay. So we have the baseline that we would see how it degrades over time if that were to occur where we get a reduction in flow.

MEMBER BANERJEE: This is in addition to the calorimetric?

MR. BROCKOFF: Yes.

CHAIRMAN RAY: Why does it use the words "in place of?"

MR. BROCKOFF: Well, it allows us to either -- it allows the operator to either use a calorimetric and divide by delta T or to use this precision flow during an outage and measure it instead so that he can pick whichever methodology he wants to confirm flow.

MEMBER BANERJEE: So when you don't have a large enough delta T they can use this as a --

MEMBER BANERJEE: If you're doing a measurement based on a heat balance, it gets more accurate the bigger the delta T?

MR. BROCKOFF: Yes, and the limiting calculation for the calorimetric is the delta T measurement and we believe we can get more precise flow differentials and have a better accuracy with the flow test than we can by using the -- dividing by the delta T. We are limited by the THAV instrument versus a pressure instrument.

MEMBER BANERJEE: The only thing is that periodically you have to check this in some way.

MR. BROCKOFF: Yes.

MEMBER BANERJEE: Also things happen in elbows like corrosion.

MR. BROCKOFF: What we would do is take the baseline data and every two years we would take precise measurement during refueling outage but we would do a continuance calorimetric versus delta T calculation. We actually calculate for every 12 hours by tech spec surveillance.

MEMBER BANERJEE: Do you have any techniques like time of flight measurements to sort of

give you the truth on this?

MR. BROCKOFF: The expert for that is Toby Burnett. He is the one at Westinghouse that came up with the methodology. It would be comparable to what we have gotten approved, I believe, in the past.

MEMBER BANERJEE: In principle it would work if we have some way to check it.

MR. BROCKOFF: We do. There is a periodicity to do the flow measurement after the baseline data. The key is we get baseline data which operating plants never really got because they were operating before they implemented the plant that did it.

CHAIRMAN RAY: Ed, you wanted to say something?

MR. CUMMINS: Yes. Ed Cummins. I would say it this way. We have some experts who believe that they can measure reactor coolant flow better than we have in the past. We have never been able to use it to show power because of its uniformity or lack of uniformity. Still the base cases calorimetric with feedwater flow being measured and that will be what we have to calibrate these flow and temperature measurements.

MEMBER BANERJEE: That is an RFS

measurement or a Venturi?

MR. CUMMINS: Yes, and some people use ultrasonic. There are various things going around. We still will use feedwater measurement and it would be simpler for the operator if we could get a direct measure so we hope it works. We have a very smart person who is trying to make it work.

CHAIRMAN RAY: So when it says in place of, it doesn't mean in place of always?

MR. CUMMINS: That's right. Always you go back to the heat balance because, as you said, over time the resistance or the pressure could be different.

MEMBER BANERJEE: Even the Venturi the same problem because we get a little rocking in the Venturi throat.

MR. CUMMINS: Yes. That led people to ultrasonic. We actually have ultrasonic also on AP1000.

CHAIRMAN RAY: Okay. So I shouldn't have read this as replacing it so you don't do a heat balance.

MR. CUMMINS: No. You may be able to reduce the frequency of the heat balance in order to meet the tech specs.

MR. BEHNKE: And the open item is associated with documenting the basis and the safety evaluation for the alternate flow measurement and actually adding a surveillance requirement.

MEMBER BANERJEE: Excuse me. Do you have this methodology for using pressure losses across various components written up somewhere in an accessible form?

MR. BEHNKE: Yes.

MR. CUMMINS: Ed Cummins. I think it's kind of a proprietary thing but we could show it to you.

CHAIRMAN RAY: So if you --

MEMBER BANERJEE: If it is not too much hassle I think it would be nice to take a look at and try to protect it appropriately.

MR. CUMMINS: We can make some arrangement. Maybe it's also some conversation with the expert that helps, too.

MEMBER BANERJEE: These are pretty large elbows in the RCS and there are very non-uniform curves and things so how is this done? It's not as simple as just putting two pressure caps on this.

CHAIRMAN RAY: Okay. So the very smart person we need to get available. Again, we need to

direct that over to the staff for follow-up with the applicant.

MEMBER BANERJEE: And some way to provide us more information on this methodology. This is going to reduce the frequency --

CHAIRMAN RAY: Mike, would you take note of that, please?

All right. Wherever you were, please continue.

MR. BEHNKE: The next open item is associated with one of the TSTFs I talked about earlier and this had to do with testing of the pressure boundary for the MCRE's main control room envelope. In this case we are fully implementing this TSTF so we will close the open item by doing that. At the time the open item was written we weren't. It's using tracer gas testing to do that control room leakage.

The next item is associated with the trisodium phosphate manufacturer's density. The surveillance requirement in the tech spec is for volume and we talk about the amount mass needed of TSP to neutralize the containment pH.

MEMBER BANERJEE: Is this the buffer you're using?

MR. BEHNKE: Yes.

MEMBER BANERJEE: Tetraborate?

MR. BEHNKE: TSP.

MEMBER BANERJEE: There is a little bit more chemical effects in the sump screen.

MR. BROCKOFF: This is Chuck Brockoff. It's trisodium phosphate is the chemical.

MEMBER BANERJEE: That you're using?

MR. BROCKOFF: Yes.

MEMBER BANERJEE: But doesn't it have more impact from GSI-191 issues than sodium tetraborate? Tom remembers. There is one which has less. You know what the issue is.

MR. BROCKOFF: Yes. The basis of putting it in is for the sump pH. The limits are 7 to 9.5 but we don't have any -- there have been no identified issues with it causing additional concerns as far as plating out on the sump screen.

MEMBER BANERJEE: There are some buffers which are better than other buffers for the sump screen problem. I don't remember if -- I mean, this is just memory but sodium tetraborate gives you less of a problem than trisodium phosphate.

CONSULTANT KRESS: That's what I remember, too.

MEMBER BANERJEE: In terms of chemical effects.

CONSULTANT KRESS: Chemical effects.

MEMBER BANERJEE: You've got a bigger head loss due to these chemical effects. This is one of the most difficult issues to deal with, chemical effects on GSI-191.

MR. CUMMINS: This is Ed Cummins again. I believe that our people think that for the AP1000 application trisodium phosphate is best. There are differences between our application and current plants.

For example, I'm not sure what all the real differences that made them decide this but we have much less concrete exposed because we have steel plates on the walls and we have very little aluminum or zinc so there are other things that we have. What we were trying to do, and I can't really justify it but people can. If you take the AP1000 environment, their assessment was that trisodium phosphate was the best one for us, not necessarily to apply to others.

MEMBER BANERJEE: You may have much less fiber. You may have much less aluminum, particular matter but as long as you are really up on the work on GSI-191. I would imagine your people are because they

are doing all the downstream testing as well. Okay. We buy that for now.

CHAIRMAN RAY: All right, Don.

MR. BEHNKE: So the issue with that open item was the staff had asked us to include the density we used to do the conversion from volume to mass in the tech spec basis.

The next item has to do with revised RCS max temperature for RCS start with RCS solid. With the AP1000 LTOPS isn't necessarily an INC type system where you arm it. The tech specs have to deal with the LTOPS arming temperature and also this temperature for the RCP start with the RCS solid and they get confusing in the tech specs the way they are laid out. That is what resulted in actually this one and the next one.

The next open item with respect to Chapter 15 references. That is a simple one where the staff had asked us to identify the specific sections in Chapter 15 reference as opposed to the chapter.

The next item has to do with minimum RCS flow for boron mixing. The minimum flow is about 3,000 gpm and the tech spec protects the safety analysis and the surveillance requirement is associated with RCPs being greater than 10 percent

which is higher than the 3,000 gpm but we had responded in an RAI response that the minimum RCP speed is much higher than that and the staff had asked us why the surveillance requirement didn't reflect that higher speed. The reason being that the higher speed is for equipment protection and the tech specs are designed to protect the safety analysis assumption.

The next open item has to do with clarification of ADS flow path operability requirements. This is strictly a logic type clarification with respect to when you have an ADS valve inoperable and protection against single failure. In a reaction statement how many other valves can you have inoperable with three or four stages of valves and the various combinations. The logic is confusing.

MEMBER BANERJEE: Do you test these valves on some schedule?

MR. BEHNKE: Yes.

MR. BROCKOFF: This is Chuck Brockoff. Our in-service testing requirements identified a testing for these in table 3916 of the DCD.

MEMBER BANERJEE: Which is roughly how often?

MR. BROCKOFF: Every refueling outage. The reason is there are two barriers to opening the power. You can only have one barrier as a challenge to safety so we do it on the shutdown condition.

MEMBER BANERJEE: All the ADS valves?

MR. BROCKOFF: No. These are the motor operated valves off of the top of the pressurizer, stage 1, 2, and 3.

MEMBER BANERJEE: It's not ADS 4?

MR. BROCKOFF: No, sir.

MR. CUMMINS: Ed Cummins. For ADS 4 there is a requirement to test the explosive on a sample basis. I think over three outages you would test all the explosives so you take it out of the thing and you put it in a test chamber and you have to show that it was acceptably powerful and that's your in-service inspection.

MEMBER BANERJEE: And you have some way to validate that they were properly installed and all that sort of stuff?

MR. BROCKOFF: Yes.

MEMBER BANERJEE: Okay.

MR. BEHNKE: The last open item has to do with equipment hatch bolting and the staff had asked us to provide the basis for the four-bolt requirement

during containment closure in the nonoperating modes, shutdown modes. We are in the process of providing that information and having them audited.

CHAIRMAN RAY: Any other questions for Westinghouse?

Eddie.

MR. GRANT: Yes, sir. Eddie Grant with NuStart. I'll address the R-COLA Chapter 16 content. Again, the same sections that are identified in the DCD. We had one COL action item that is related to the tech specs and one related to 16.3 which is on the investment protection.

The one COL item is to fill in the brackets basically. As the DCD was written it left a number of items for the COL applicant to fill in. These are all identified with brackets so we just refer to the bracketed information.

After the changes that were made in Rev. 17 for the DCD the only remaining bracketed information was plant specific information. Things like the exclusionary boundary, the no-population zone, the names of organization individuals like shift supervisor or plant managers, those types of things.

Administrative controls throughout Section 5 or some specific design items. Again, the EAB or

LBZ in Section 4. We have filled those in. There are no remaining brackets within the plant-specific tech specs for Bellefonte so we feel like we have completed that item.

Again, that is a standard item. However, some of the specifics of filling those in, again the EAB and the LBZ, will be different for each plant but each one of us -- each S-COLA has filled those in as well and so there will be no bracketed information for any of the S-COLAs.

Also, 16.3. This was to provide a procedure to control the operability of investment protection systems, structures, and components. In lieu of the actual procedure we describe the procedures that were going to be used to govern and control the investment for protection of structures, systems and components and those procedures that would instruct the staff to address the appropriate action should there be a problem.

Those are written in 16.3 much like the tech specs with an operability requirement, action requirements if there is a problem with one of those pieces of equipment so they have the same types of things in the procedures and we'll follow those actions.

That is pretty much it. There was no additional supplemental information that was necessary. I would point out that since that Rev. 1 that is the basis for this slide, we have provided one additional departure in relation to this. If you go back to Chapter 1, yesterday we talked about a departure on the EAB chi over qs.

The results of that have identified the need for one additional tech spec change so it will be a departure from the DCD and that is Bellefonte specific. It's related to containment and we'll talk about that some more with Chapter 6. In fact, we'll probably talk about that quite a bit with Chapter 6 so we'll put that off till the fall.

There is one remaining open item. The staff has identified a need for a setpoint control program. At this point I would say we are working with the staff to understand what they want in that control program and the need for it. We hope to work that out in the next few weeks.

CHAIRMAN RAY: Okay. Any questions for NuStart? All right. If not, we will -- for John what I plan to do is go through the staff's response to Chapter 16 thereby completing all of our items. Then we'll have a brief -- we'll terminate the meeting.

Those who wish to can certainly leave for their transportation but we will resume after a brief adjournment for some open discussion among the members and with members of staff in the wake of this second day. You can stay or go as you wish.

So, having said that, Manny, are you leading this or who?

MR. MITRA: I am leading it. My name is S. K. Mitra. I am the chapter lead for AP1000 DCA. Manny is the chapter lead for the Bellefonte COLA. With me is Bob Tjader who is the lead reviewer. On the floor I have Hien Lee and Rick Scully and Malcolm Patterson if any question may arise that they can answer.

We have 10 open items mainly on the technical specification area in 16.1. On Bellefonte, as Eddie said, we have one open item and the rest is all IBR. With that I will give it to Bob Tjader.

MR. TJADER: Thank you, S.K. As S.K. mentioned and Don mentioned, there are 10 open items, if we could have the next slide, with respect to tech specs. They are the 10 open items which are consistent with what Don had discussed. He did an excellent job in discussing those. I was going to discuss the first four. All of these items are

basically involving information to verify tech spec limits or tech spec information.

The top four I put in bold. I consider them the more significant but to some degree they all require some information to justify. I don't see any need to add additional information unless you have questions of me with respect to how they affect tech specs or something like that. Those are the 10 open items.

MEMBER BANERJEE: Well, I guess we are going to get some information.

MR. TJADER: With regard to the --

MEMBER BANERJEE: The second item

MR. TJADER: -- full measurements for the TP tests. Yes, we'll provide that. There is a surveillance requirement. Basically from a tech spec point of view we need to add a surveillance requirement to allow this TP test to be utilized as an alternate method.

MEMBER BANERJEE: What does the RCS minimum flow requirement inconsistency?

MR. TJADER: That is what Don had discussed with regard to the minimum flow requirement is 3,000 gallons per minute in the specs.

MEMBER BANERJEE: Oh, okay. Why is there

an inconsistency there? Why do you use the word inconsistency?

MR. TJADER: Well, I believe the surveillance test to the 10 percent level, not 3,000. In essence, if it failed that surveillance that, in essence, would be perhaps prematurely failing the surveillance prior to its 3,000 gallon per minute safety limit. They would do an operability determination to evaluate whether or not it, in fact, met the 3,000 gallons per minute. There was some discussion needed, some justification needed to revise the different levels for flow utilized in the spec in the surveillance.

MEMBER BANERJEE: So you're saying the open issue there relates to more discussion or justification of this minimum level?

MR. TJADER: Yes.

MEMBER BANERJEE: Is that --

MR. TJADER: Yes.

MEMBER BANERJEE: Okay. Is that your understanding as well?

MR. TJADER: Yes. Some of these, as Don indicated, they've already provided responses for. For instance, they are going to incorporate the 448 and the fourth item there, the control room

habitability tech spec change. We've got to review that to confirm that it's adequate. These are the open items.

CHAIRMAN RAY: That's fine.

MR. TJADER: On the next page this has to do, Mr. Ray, with what you had asked about with that in that last year with Interim Staff Guidance 8 that was issued it was determined that tech specs basically have pawned the COL issuance have to be complete.

What that means, as the ISG points out, there are three ways of satisfying the information or the limits or the values in tech specs and one is to provide the plant specific value (Option 1) which is, in essence, what Bellefonte has done in virtually every case, or at least they have proposed. Then there is Option 2 where you can have a bounding value to the plant specific value.

Or the third alternative is you can have an administrative control tech spec that references an approved methodology to determine the plant specific value. If you are familiar with the cooperative limiting report it will be similar to that type of thing. Then they would record the tech spec value in an approved licensee controlled document.

Those are the three methods that have been

determined to be appropriate for satisfying tech spec completeness at COL issuance. Completeness has been determined to be that the tech specs have to be implementable for operation when they are issued.

Then the final slide which is with respect to, as Eddie indicated, the open item with regard to Bellefonte. Bellefonte proposed to provide instrumentation system settings, specific ones in Option 1.

They have provided those with the specs right now but the staff does not have sufficient information to conclude that Option 1 is acceptable. They may have to -- Bellefonte may have to implement a setpoint control program consistent with Option 3 that is utilizing approved methodology to determine those setpoints. And I just wanted --

CHAIRMAN RAY: Seems like a generic observation here to me.

MR. TJADER: Yes.

CHAIRMAN RAY: Perhaps COL applicants for the 10th plant or something wouldn't have to do this, I guess.

MR. TJADER: It depends on whether or not the 10th plant can adequately identify the instrumentation package and whether or not they can

adequately apply the approved methodology in their setpoint study.

CHAIRMAN RAY: I guess I wasn't really focusing on the 10th plant as much as I was on the first plant. It looks like it's always going to be true for the first plant that the only way you are going to get tech specs out the door is Option 3.

MR. TJADER: It would seem that way to us but perhaps Bellefonte is a step ahead of us. I don't know.

CHAIRMAN RAY: Well, they may be but it doesn't sound like we are going to be convinced enough to exercise Option 1.

MR. TJADER: We certainly hope to change your mind, or their minds --

CHAIRMAN RAY: Not my mind.

MR. TJADER: -- over the next few weeks and then we'll come back and explain to you whether we were successful.

CHAIRMAN RAY: Okay. All right.

MR. COMAR: I need to go back to the previous slides where we talk about 16.2 and 16.3. 16.2 relates to Design Reliability Assurance Program which has already been addressed as 17.4. 16.3 is Investment Protection or availability controls. I'm

going to ask Malcolm to come and talk about the availability controls.

MEMBER BANERJEE: Where are we right now?

MR. COMAR: 16.1 has already been completed. 16.2 is already covered under Chapter 17.4 which you heard this morning which is the D-RAP program. The only thing left here is the investment protection as Eddie talked about, or the availability control. I'm going to have Malcolm address it.

CHAIRMAN RAY: All right. Come on, Malcolm. Do you have a page also?

MEMBER BANERJEE: This is page 3. He went back. Which one is Malcolm?

MR. COMAR: It's basically an IBR that supplements so we figured he would be able to explain it to you.

CHAIRMAN RAY: I'm sure he will be. Does he have a page that he wants us to look at?

MR. PATTERSON: This is Malcolm Patterson from the staff.

CHAIRMAN RAY: Be quick.

MR. PATTERSON: Brevity is the soul of wit. 16.2 does nothing more than point to 17.4 and the fuel well application incorporates that by reference so there is really nothing to present to

you.

16.3 had a few changes from Rev. 15. They were all editorial or simply to make this section consistent with minor changes that had been evaluated elsewhere in the DCD. The salient point was the supplement provided to describe how the availability controls would be imposed. You have already heard about that. We received it and it's acceptable by the staff so there is not much to discuss.

MEMBER BANERJEE: Good.

CHAIRMAN RAY: All right. We might plunge into it in the sense that you just told us what you just said now a second time. How exactly it's going to happen might be a question for somebody but it's not one I'm going to ask at this time. Anybody have any questions of Malcolm? Thank you.

Okay. Anything more from you folks? Eileen?

MS. McKENNA: Nothing more here.

CHAIRMAN RAY: Stephanie, do you have anything you want to say?

MS. COFFIN: Not other than to thank you.

CHAIRMAN RAY: All right. As I said, we will adjourn briefly. We'll close the record.

(Whereupon, the above-entitled matter went off

1 the record at 2:50 p.m.)

AP1000 Design Control Document
Amended Design

Chapter 14

Westinghouse

Chapter 14 Overview

- Initial Plant Test Program
  - Specific Information to be Included Preliminary/Final Safety Analysis
  - Pre-operational Test
  - Certified Design Material
  - Combined Licensee Applicant Responsibilities

Major Changes

- Combined License Holder Items for
  - Information in 14.4.3 – “Conduct of Test Program” (TR71B)
    - COL Applicant responsible for providing “Start-up Administration Manual”
  - Information in 14.4. 2 – “Test Specification and Procedures” (TR71A)
    - COL Applicant responsible for writing test specifications, test procedures and start-up procedures

- Proposed response to “As-Built” Definition

Open Items

Three open items were identified

- **OI-SRP14.3-NWE2-01**
  - Clarify AP1000 definition of As-Built
- **OI-SRP-14.2-CQVP-12**
  - Restore COL information item 14.4.2
- **OI-SRP14.2-CQVP-13**
  - Restore COL information item 14.4.3

- Chapter 14

Initial Test Program

R-COLA Chapter 14 – Content

Initial Test Program

14.1 SPECIFIC INFORMATION TO BE INCLUDED IN PRELIMINARY/FINAL SAFETY ANALYSIS REPORTS

14.2 SPECIFIC INFORMATION TO BE INCLUDED IN STANDARD SAFETY ANALYSIS REPORTS

14.3 CERTIFIED DESIGN MATERIAL

14.4 COMBINED LICENSE APPLICANT RESPONSIBILITIES

R-COLA Chapter 14 COL Items

STD 14.4-1 **Organization and Staffing**
– information described

STD 14.4-2 **Test Specifications and Procedures**
– post COL item – license condition proposed

STD 14.4-3 **Conduct of Test Program**
– post COL item – license condition proposed

STD 14.4-4 **Review and Evaluation of Test Results**
– post COL item – license condition proposed

R-COLA Chapter 14
COL Items

STD 14.4-5 **Interface Requirements**
- **Test abstracts provided**

STD 14.4-6 **First-Plant-Only and Three-Plant-Only Tests**
- **post COL item – license condition proposed**

R-COLA Chapter 14 – Other

14.2 STD SUP **Schedule information**

14.3 STD SUP **Additional ITAAC**

R-COLA Chapter 14 – Open Items

- **Proposed License Condition 6 – STD**
  - **Operational Program - Related to Chapter 1 OI – License Conditions**
- **Proposed License Condition 8 – STD**
  - **Changes to Startup Test Program - Related to Chapter 1 OI – License Conditions**

AP1000 Design Control Document
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Chapter 17

Westinghouse

Tier 2 Chapter 17

This chapter discusses the following:

- Quality Assurance during
  - Design and Construction Phases
  - Operations Phase
  - Design, Procurement, Fabrication, Inspection, Testing

Major changes:

- Clarification re: ASME NQA-1-1994

Tier 2 Chapter 17

- No COL Information Items changes

- **OI-SRP17.3-CQVP-01**
  - NRC may inspect the Westinghouse implementation of QMS

- Chapter 17

Quality Assurance

R-COLA Chapter 17 – Content

Quality Assurance

17.1 QUALITY ASSURANCE DURING THE DESIGN AND CONSTRUCTION PHASES

17.2 QUALITY ASSURANCE DURING THE OPERATIONS PHASE

17.3 QUALITY ASSURANCE DURING DESIGN, PROCUREMENT, FABRICATION, INSPECTION, AND/OR TESTING OF NUCLEAR POWER PLANT ITEMS

17.4 DESIGN RELIABILITY ASSURANCE PROGRAM

17.5 QUALITY ASSURANCE PROGRAM DESCRIPTION – NEW LICENSE APPLICANTS

17.6 MAINTENANCE RULE PROGRAM

17.7 COMBINED LICENSE INFORMATION ITEMS

17.8 REFERENCES

R-COLA Chapter 17 – COL Items

BLN 17.5-1 **Quality Assurance Design Phase – Utilizing existing TVA QA program until COL issued**

STD 17.5-2 **Quality Assurance for Procurement, Fabrication, Installation, Construction and Testing – included in proposed QAPD – based on NEI 06-14A**

STD 17.5-4 **Quality Assurance Program for Operations – included in proposed QAPD**

R-COLA Chapter 17 – Other

R-COLA Chapter 17 – Open Items

OI 17.1-1 **RG 1.33 application in NEI 06-14 - STD**

- NRC approve and Applicant adopt approved template

OI 17.1-2 **Inspection re: hydrology documentation - BLN**

- NRC to schedule

OI 17.1-3 **Inspection re: contractor oversight - BLN**

- NRC to schedule

R-COLA Chapter 17 – Open Items

OI 17.5-1 **Regulation citation correction - STD**
- NEI 06-14 revision to address

OI 17.5-2 **Independent reviews - STD**
- NEI 06-14 revision to address

OI 17.5-3 **Identification of "licensee" - STD**
- NEI 06-14 revision to address

OI 17.5-4 **Commercial grade calibration - STD**
- NEI 06-14 revision to address

OI 17.5-5 **Commercial grade dedication - STD**
- NEI 06-14 revision to address

OI 17.5-6 **Clarify RG position documentation – STD**

AP1000 Design Control Document Amended Design

17.4 – D-RAP

Westinghouse

Chapter 17 - D-RAP

- Design Reliability Assurance Program (D-RAP)

- Major changes:
  Incorporation of Maintenance Rule per NEI 07-02A

  - **OI-SRP17.4-SPLA-01**
    - Common-cause RCP trip failure removal from PRA

  - **OI-SRP17.4-SPLA-04**
    - Resolve need for an alternative D-RAP ITAAC

17.4 and 17.6
Design Reliability Assurance Program
Maintenance Rule

17.4 and 17.6

17.4 DESIGN RELIABILITY ASSURANCE PROGRAM

- **IBR DCD**

17.6 STD SUP **Maintenance rule program description**

- **IBR NEI 07-02A**

COL Item

STD 17.5-8 **Operational Reliability Assurance Program Integration with Quality Assurance Program**

– Implemented via Operational Programs

AP1000 Design Control Document
Amended Design

Chapter 19

Westinghouse

Tier 2 Chapter 19

- **Chapter Overview**
  - Probabilistic Risk Assessment
    - Internal Events
    - External Events
  - Ex-Vessel Severe Accident Phenomena
  - Additional Assessment of AP1000 Design Features
  - Equipment Survivability Assessment
  - Shutdown Evaluation
  - Malevolent Aircraft Impact

Description of Major Changes Post Revision 15

- Addressed site-specific design and site-specific external hazards in a standard manner
- PRA model changed from proprietary PRA software to CAFTA and evaluated and updated as necessary for various design changes
- Addition of Appendix 19F regarding malevolent aircraft impacts

SER Open Items

- **OI-SRP19.0-SPLA-07**
  - Update of resolved and re-quantified PRA model and any DCD changes that may be necessary
- **OI-SRP19.0-SPLA-13**
  - Update of the shutdown PRA risk and any DCD changes that may be necessary
- **OI-SRP19.0-SPLA-12**
  - Maintain acceptable seismic margin for Hard Rock High Frequency sites
- **OI-SRP19.0-SPLA-14**
  - More information on the containment inventory of radionuclides used for equipment survivability evaluation
- **OI-SRP19.0F-SPLA-01**
  - OI for review of Appendix 19F, “Malevolent Aircraft Impact”
    - Awaiting Regulator Guidance for review of Section

• Chapter 19
Probabilistic Risk Assessment

R-COLA Chapter 19 – Content

Probabilistic Risk Assessment

19.1 INTRODUCTION

19.2 INTERNAL INITIATING EVENTS

19.3 MODELING OF SPECIAL INITIATORS

…

19.57 INTERNAL FIRE ANALYSIS

19.58 WINDS, FLOODS, AND OTHER EXTERNAL EVENTS

19.59 PRA RESULTS AND INSIGHTS

R-COLA Chapter 19 COL Items

STD 19.59.10-1 **As-Built SSC HCLPF Comparison to Seismic Margin Evaluation – As-built item – proposed license condition**

STD 19.59.10-2a **Evaluation of As-Built Plant Versus Design in AP1000 PRA – As-built item – proposed license condition**

STD 19.59.10-2b **Evaluation of Site-Specific PRA External Events – confirmed generic analysis is applicable**

STD 19.59.10-3 **Internal Fire and Internal Flood Analyses – As-built item – proposed license condition**

R-COLA Chapter 19
COL Items

STD 19.59.10-4 Develop and Implement Severe Accident Management Guidance
– As-built item – proposed license condition

STD 19.59.10-5 Equipment Survivability
– As-built item – proposed license condition

R-COLA Chapter 19 – Other

19.59.10.6 STD SUP **PRA configuration controls description**

R-COLA Chapter 19 – Open Items

OI 19.58-1 **Staff to complete hydrology impact review - BLN**

- **NRC Staff action to complete review**

OI 19.58-2 **Staff to complete toxic chemical impact review - BLN**

- **NRC Staff action to complete review**

OI 19.59-1 **Staff to complete DCD seismic margins review - STD**

- **WEC & NRC Staff action to complete review**

AP1000 Design Control Document
Amended Design

Chapter 16

Westinghouse

Tier 2 Chapter 16 Overview

- This chapter describes the:
  - Generic Technical Specifications
  - Investment Protection Controls

Tier 2 Chapter 16
Description of Major Changes

- Resolve technical bracketed items in the generic tech specs of the AP1000 DCD, and document activities required for COL Information Item 16.1-1
- Update Tech Specs to reflect design changes, examples include
  - Revise ADS valve stroke time requirements
  - Gray Rod Swap and Operational Requirements Consistent with use of the On-Line Power Distribution Monitoring System (OPDMS)
- Incorporated appropriate TSTFs, Generic Letters and GSIs

Tier 2 Chapter 16
Open Items

- **Open Items:**
  - **OI-SRP16-CTSB-42**
    - Revised OTdT & OPdT setpoint equation (Justify/Revise WCAP)
  - **OI-SRP16-CTSB-25**
    - Provide justification for RCS flow testing in place of a precision heat balance (calorimetric) and provide associated SR
  - **OI-SRP16-CTSB-32**
    - TSTF-448, MCRE testing SR and methodology
  - **OI-SRP16-CTSB-33**
    - TSP manufacturer's density
  - **OI-SRP16-CTSB-55**
    - Revised RCS max temperature for RCP start with RCS solid

Tier 2 Chapter 16
Open Items

- **Open Items (con't):**
  - **OI-SRP16-CTSB-54**
    - Apparent LTOP TS Bases inconsistencies
  - **OI-SRP16-CTSB-61**
    - Chapter 15 references
  - **OI-SRP16-CTSB-62**
    - Minimum RCS flow for boron mixing
  - **OI-SRP16-CTSB-07**
    - Clarification of ADS flow path Operability requirements
  - **OI-SRP16.1.1-SEB1-01**
    - Containment Equipment Hatch bolting

- Chapter 16

Technical Specifications

R-COLA Chapter 16 – Content

Technical Specifications

16.1 TECHNICAL SPECIFICATIONS

16.2 DESIGN RELIABILITY ASSURANCE PROGRAM

16.3 INVESTMENT PROTECTION

R-COLA Chapter 16 – COL Items

STD 16.1-1 **Technical Specification Preliminary Information**
- all bracketed information completed

STD 16.3-1 **Procedure to Control Operability of Investment Protection Systems, Structures and Components**
- procedures described

R-COLA Chapter 16 – Other

No other information necessary.

R-COLA Chapter 16 – Open Items

- **Setpoint methodology - STD**
  - **Describe setpoint control program**

AP1000 Design Control Document
Amended Design

Chapter 4

Westinghouse

Tier 2 Chapter 4 Overview

- This chapter describes the mechanical components of the reactor and reactor core, including:
  - fuel rods
  - fuel assemblies
  - nuclear design
  - thermal-hydraulic design
  - materials
  - functional design of reactivity control systems

Tier 2 Chapter 4
Description of Major Changes

- Updated gray rod control assembly (GRCA) design
- Revised the burnable absorber rod design to include both wet annular burnable absorbers (WABAs) to borosilicate glass to address an inconsistency in the certified design
- CRDM material changes
- Reactor internal material specification changes
- Change the Soluble Boron Credit Analysis

Tier 2 Chapter 4
Open Items

One Open Item:

- **OI-SRP4.5.1-CIB1-01**
  - Need to address the use of Reg Guide 1.44 and CRDM canopy seal welds material

- **OI-SRP9.1.1-SRSB-01**
  - Soluble Boron Credit Methodology pending staff approval of WCAP-14416-P

- Chapter 4
  Reactor

R-COLA Chapter 4 – Content

Reactor

4.1 SUMMARY DESCRIPTION

4.2 FUEL SYSTEM DESIGN

4.3 NUCLEAR DESIGN

4.4 THERMAL AND HYDRAULIC DESIGN

4.5 REACTOR MATERIALS

4.6 FUNCTIONAL DESIGN OF REACTIVITY CONTROL SYSTEMS

R-COLA Chapter 4

R-COLA Chapter 4 – 1 COL Item

STD 4.4-2 Confirm Assumptions for Safety Analyses DNBR Limits – post COL item – license condition proposed

R-COLA Chapter 4 – Other

No other information

This chapter entirely IBR except for one COL item

R-COLA Chapter 4 – Open Items

There are no open items for Chapter 4.

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SER/OI Chapter 4
Reactor

July 23 – 24, 2009

Staff Review Team

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  - **Fred Forsaty**, SRSB/DSRA

- Project Managers
  - **Phyllis Clark**, AP1000 DCA
  - **Ravi Joshi**, AP1000 Bellefonte COL

Overview of DCA and COL

SRP Section/Application Section		Open Items	
		AP1000 DCA	Bellefonte
4.1	Summary Description	0	IBR – 0
4.2	Fuel System Design	0	IBR – 0
4.3	Nuclear Design	1	IBR – 0
4.4	Thermal and Hydraulic Design	0	IBR – 0
4.5	Reactor Materials	1	IBR – 0
4.6	Functional Design of Reactivity Control System	0	IBR – 0
Totals		2	0

Overview of AP1000 DCA Chapter 4 - Reactor

DCD Section		Summary of Changes to DCA
4.1	Summary Description	Revised summary description of core/fuel design
4.2	Fuel System Design	**Changes to gray rod control assembly design** **Addition of borosilicate glass burnable absorber rods** Revised top nozzle design **Deletion of COL Items 4.2-1, 4.3-1, and 4.4-1**
4.3	Nuclear Design	On-line monitoring of power distribution **Revised criticality design methodology outside reactor (OI-SRP9.1.1-SRSB-01)**
4.4	Thermal and Hydraulic Design	Revision of core bypass flow paths **Change of COL item 4.4-2 to COL Holder's item**
4.5	Reactor Materials	**Revised material specifications**
4.6	Functional Design of Reactivity Control System	No major changes

Technical Topics of Interest, AP1000 DCA

<u>Changes to Gray Rod Control Assemblies (GRCA)</u>

- DCA modified the GRCA design
  - Increased the number of rodlets from 4 to 12 per assembly
  - Decreased the rodlet diameter
  - Maintained reactivity worth while lessening the local power perturbations
  - The new GRCA design does not result in a more limiting case and no change to the accident analysis is needed
- Staff finds this design change acceptable

Technical Topics of Interest, AP1000 DCA

<u>Addition of Borosilicate Glass Burnable Absorber Rods Design</u>

- DCD was modified to include borosilicate glass burnable absorbers (BAs), in addition to previously approved Wet Annular Burnable Absorber (WABA)
  - NRC previously approved use of similar borosilicate BAs
  - Expected AP1000 core operation parameters are similar to previously approved borosilicate glass BAs
- Staff finds this change acceptable

Technical Topics of Interest, AP1000 DCA

<u>Deletion of COL Items 4.2-1, 4.3-1 & 4.4-1</u>

- COL Items require COL applicants to address changes to reference design of fuel, BA rods, RCCA, or initial core design from DCD
- DCD Revision 17 and APP-GW-GLR-059 describe changes from DCD Revision 15
- Fuel design and initial core design are Tier 2* information
- Prior NRC approval is required for future changes to DCD Tier 2* information

Technical Topics of Interest, AP1000 DCA

<u>Revised Criticality Design Method Outside Reactor</u>

- DCD Revision 16 references disapproved WCAP-14416 for criticality analysis
- In DCD Revision 17 Westinghouse completely revised AP1000 Criticality Analysis
- The new SFP criticality analysis is documented in APP-GW-GLR-029 Revision 1, entitled “AP1000 Spent Fuel Storage Racks Criticality Analysis” which is under review
- Open Item OI-SRP9.1.1-SRSB-01 pending NRC approval of new SFP criticality analysis

Technical Topics of Interest, AP1000 DCA

<u>Change of COL Information Item 4.4-2 (DCD Section 4.4.7)</u>

- In DCD Revision 15, COL Information Item 4.4-2 specified COL applicant to calculate instrumentation uncertainties of operating plant parameters and design limit DNBR using revised thermal design procedure (RTDP) to confirm validity of the DCD design limit DNBR
- DCD Revision 17 revised COL item 4.4-2 to COL holder's required action prior to initial fuel load
- The staff finds COL holder's required action acceptable because:
  - Instrument uncertainties can only be calculated after selection of actual plant operating instrumentation
  - COL holder is required to use approved method for calculations of instrumentation uncertainties and design limit DNBR
  - DCD Design limit DNBR was calculated based typical instrumentation uncertainties expected to be bounding uncertainties of selected instrumentation
  - Margins between safety analysis minimum DNBRs and DCD design limit DNBR available to offset increase of design limit DNBR
  - Different instrumentation with less uncertainties can be selected

Technical Topics of Interest, AP1000 DCA

<u>Control Rod Drive (CRD) Structural Materials</u>

- DCA added austenitic stainless steels (solution annealed) - 304, 304L, 316 and 316L to certified materials (304LN and 316LN)
- Open Item OI-SRP4.5.1-CIB1-01: 304 and 316 may be more susceptible to SCC in stagnant water conditions (high oxygen) in CRD components
- Westinghouse response would revise DCD to provide controls on preventing SCC:
  - RG 1.44 – avoiding sensitized material
  - RG 1.37 – cleaning procedures and contamination prevention
  - AP1000 CRDs are redesigned – reduce number of welds, reduce stresses, use of vent drain lines to prevent stagnant water conditions
- Staff finds response acceptable

Technical Topics of Interest, AP1000 DCA

Reactor Internals and Core Support Materials

- DCA added new materials:
  - Austenitic stainless steels (solution annealed) -304, 304L and 304H
  - Nickel-based Alloys 718 and 750
  - Nickel-based Alloy 690
  - Stellite 6 hardfacing
- Staff finds these material additions acceptable based on:
  - current PWR operating experience
  - compliance with RG 1.44 guidelines
  - 304H has maximum carbon content of 0.08%
  - nickel alloys are heat-treated to prevent SCC
  - materials assessed for IASCC and void swelling
  - satisfying ASME Code, Section III, Subsection NG rules
- No open items

Overview of Bellefonte COL Chapter 4 - Reactor

FSAR Section		Summary of Departures/Supplements
4.1	Summary Description	Completely IBR*
4.2	Fuel System Design	Completely IBR
4.3	Nuclear Design	Completely IBR
4.4	Thermal and Hydraulic Design	**IBR with STD COL 4.4-2**
4.5	Reactor Materials	Completely IBR
4.6	Functional Design of Reactivity Control System	Completely IBR

* IBR - incorporated by reference

Technical Topics of Interest, BLN COL

- AP1000 COL Information item 4.4-2

  Upon selection of the actual instrumentation, the COL Holder shall calculate the instrumentation uncertainties of the operating parameters and confirm the validity of the design-limit DNBR.

- STD COL 4.4-2:

  "Following selection of actual plant operating instrumentation and calculation of the instrumentation uncertainties of the operating plant parameters, the design DNBR will be calculated using the RTDP with these instrumentation uncertainties and confirm that the design limit DNBR values as described in DCD Section 4.4 remain valid or that the safety analysis minimum DNBR bounds the new design limit DNBR values plus DNBR penalties, such as rod bow penalty. This will be completed prior to fuel load."

- Part 10, License Condition 2, Item 4.4-2

  Applicant proposed a license condition which will require the completion of the actions described in STD COL 4.4-2 prior to initial fuel load.

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SER/OI Chapter 14
Initial Test Program and ITAAC

July 23–24, 2009

Staff Review Team

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  - **Greg Galletti**, Quality and Vendor Branch 1, CQVP/DCIP
- **Project Managers**
  - **David Jaffe**, Senior Project Manager, AP1000 DCA
  - **Manny Comar**, Senior Project Manager, BLN COL

Overview of DCA and COL

Section		Open Items	
		DCA	**Bellefonte**
14.1	Specific Information To Be Included in Preliminary Safety Analysis Reports	0	IBR
14.2	Specific Information To Be Included in Standard Safety Analysis Reports: Initial Plant Test Program	0	IBR with supplements **2 Open items**
14.3	Tier 1 Information	1	IBR with supplements
14.4	Combined License Applicant Responsibilities	2	IBR with supplements
Totals		3	2

Overview of AP1000 DCA Chapter 14 Initial Test Programs

DCD Section		Summary of Changes to DCA
14.1	Specific Information	-None
14.2	Preoperational Test Abstracts	-Changes to selected test abstracts
14.3	Tier 1 Information	- **Definition of "As-Built"**
14.4	COL Applicant Responsibilities	- Proposed methodology for AP1000 test specifications and procedures development - Proposed administrative process and program controls to be utilized in the conduct of the AP1000 Startup Test Program - Clarified test requirements related to first-plant-only and three-plant-only tests

Section 14.3
July 7th ACRS presentation
Definition of “As-Built”

- It may be impractical to perform some inspections and testing for ITAAC after SSC installation
- In those cases, it may be appropriate to perform inspections or tests prior to final installation
- NEI 08-01 Section 3.1.4 includes language that limits use of other than in-place inspections for ITAAC
- Future design certifications and design certification amendments should also include the additional discussion in NEI 08-01 Section 3.1.4 for definition of “as-built”

Section 14.3
Status of “As-Built” Definition

- Staff requested that Westinghouse incorporate the clarification in the AP1000 definition
- Westinghouse proposed to include the additional language of Section 3.1.4 in Tier 2 information
- Staff’s position is that Westinghouse should add the clarification to Tier 1 in the definition of “as-built”

Overview of Bellefonte COL Chapter 14 Initial Test Programs

FSAR Section		Summary of Departures/Supplements
14.1	Specific information to be included in preliminary FSAR	- IBR
14.2	Initial test Program	- STD SUP 14.2-1 Test Program Schedule
14.3	Certified Design Material	- **STD SUP 14.3-1 Selection methodology and Selection criteria for ITAAC** - **BLN SUP 14.3-2 SS-ITAAC**
14.4	COL Applicant Responsibilities	- STD COL 14.4-1 Organization and Staffing - STD COL 14.4-2 Test Specifications and Procedures - STD COL 14.4-3 Conduct of Test Program - STD COL 14.4-4 Review, Evaluation, and Approval of Test Results - STD COL 14.4-5 Interface Requirements

Overview of AP1000 DCA Chapter 14 Initial Test Programs

DCD Section		Summary of Changes to DCA*
14.1	Specific Information	-None
14.2	Preoperational Test Abstracts	-Changes to selected test abstracts
14.3	Tier 1 Information	- Definition of "As-Built"
14.4	COL Applicant Responsibilities	- **Proposed methodology for AP1000 test specifications and procedures development** - **Proposed administrative process and program controls to be utilized in the conduct of the AP1000 Startup Test Program** - **Clarified test requirements related to first-plant-only and three-plant-only tests**

Technical Topics of Interest AP1000 DCA

Test Specifications and Procedures

- Westinghouse proposed methodology for the development of AP1000 test specifications and procedures
  - APP-GW-GLR-037, Rev.1 (TR-71A)
    - Methodology inconsistent with current regulatory guidance applicable to COL applicants
  - COL Information Item 14.4-2 (STD COL 14.4-2)
    - COL holder will provide the preoperational and startup procedures to the NRC prior to each planned test
- NRC staff rejected Westinghouse's TR-71A in a letter dated 08/21/07 (ML072260599)

Technical Topics of Interest AP1000 DCA

Conduct of Test Program

- Westinghouse proposed a program management description outlining the AP1000 startup administrative manual requirements
  - APP-GW-GLR-038, Rev.2 (TR-71B)
    - Methodology inconsistent with current regulatory guidance applicable to COL applicants
  - COL Information Item 14.4-3 (STD COL 14.4-3)
    - COL holder responsible for a startup administration manual containing administration procedures and requirements that govern the initial test program activities
- NRC staff rejected Westinghouse's TR-71B in a letter dated 09/18/08 (ML082520572)

Technical Topics of Interest
AP1000 DCA

First-Plant-Only and Three-Plant-Only Tests

- Westinghouse clarified timing of AP1000 first-plant-only and three-plant-only tests
  - APP-GW-GLR-021, Rev.1 (TR-6)
    - Change clarifies the COL holder responsibility, in contrast to the previous assignment of responsibility to either the COL applicant or holder
  - COL Information Item 14.4-6 (STD COL 14.4-6)
    - COL holder shall perform the tests in subsection 14.2.5 or shall provide a justification prior to preoperational testing
- NRC staff accepted Westinghouse's TR-6 proposed changes related to first-plant-only and three-plant-only tests

Overview of Bellefonte COL Chapter 14 Initial Test Programs

FSAR Section		Summary of Departures/Supplements
14.1	Specific information to be included in preliminary FSAR	- IBR
14.2	Initial test Program	- STD SUP 14.2-1 Test Program Schedule
14.3	Certified Design Material	- STD SUP 14.3-1 Selection methodology and Selection criteria for ITAAC - BLN SUP 14.3-2 SS-ITAAC
14.4	COL Applicant Responsibilities	- STD COL 14.4-1 Organization and Staffing - **STD COL 14.4-2 Test Specifications and Procedures** - **STD COL 14.4-3 Conduct of Test Program** - STD COL 14.4-4 Review, Evaluation, and Approval of Test Results - **STD COL 14.4-5 Interface Requirements**

Technical Topics of Interest
BLN COL

Test Specifications and Procedures

- AP1000 COL Information Item 14.4-2

  COL holder will provide the preoperational and startup test procedures to the NRC prior to each planned test

- STD COL 14.4-2
  - Development process described in BLN COLA consistent with current regulatory guidance
  - COL holder will submit to NRC a schedule to support operational program readiness and will include submittal of test specifications and procedures to NRC onsite inspectors

- Adequacy of administrative controls for the development of test specifications and procedures remains an open item

Technical Topics of Interest
BLN COL

Conduct of Test Program

- AP1000 COL Information Item 14.4-3

  COL holder is responsible for providing a site-specific SAM prior to initiating the test program

- STD COL 14.4-3
  - Administrative controls for the development of a site-specific SAM described in BLN COLA consistent with current regulatory guidance
  - Changes to the initial test program will be controlled and reported to the NRC

- Adequacy of administrative controls for changing the test program remains an open item

Technical Topics of Interest
BLN COL

Interface Requirements

- AP1000 COL Information Item 14.4-5

  COL applicant is responsible for testing that may be required of structures and systems which are outside the scope of this design certification

- STD COL 14.4-5
  - The applicant provided test abstracts for the following systems:
  - Storm drains (Section 14.2.9.4.22)
  - Offsite ac power systems (Section 14.2.9.4.23)
  - Raw water systems (Section 14.2.9.4.24)
  - Sanitary drainage system (Section 14.2.9.4.25)
  - Fire brigade support equipment (Section 14.2.9.4.26)
  - Portable personnel monitors and radiation survey instruments (Section 14.2.9.4.27)
  - Cooling tower(s) (Section 14.2.10.4.29)

- No open items

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SER/OI Chapter 16
Technical Specifications

July 23–24, 2009

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Project Managers

- **Sikhindra Mitra**, AP1000 DCA
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Overview of DCA and COL

SRP Section/Application Section		Open Items	
		AP1000	**Bellefonte**
16.1	Technical Specifications	10	1
16.2	Design Reliability Assurance Program	0	IBR
16.3	Investment Protection	0	IBR w/ SUP
Totals		10	1

Open Issues, DCA

- **OTdT & OPdT (Justify/Revise WCAP)**
- **Need SR for RCS elbow tap flow measurements**
- **ADS TS conditions/stage requirements not clear**
- **Control room habitability TS change not incorporated**
- TSP manufacturer's density
- RCS temp limit for pump start, justification
- RCS min flow requirement inconsistency
- Equipment hatch bolt design needs audit
- Bases inconsistencies (TS 3.4.14)
- Explicit FSAR references needed

TECHNICAL SPECIFICATION (TS) COMBINED LICENSE INFORMATION

In accordance with DC/COL-ISG-8, at COL issuance all TS information must be resolved by:

- providing a plant specific value (Option 1), or
- providing a value that is bounding to plant specific value (Option 2), or
- providing an administrative control TS that requires use of an NRC-approved methodology to determine plant specific value and document for recording value (Option 3)

Technical Topics of Interest, BLN COL

- BLN proposes to provide instrumentation system settings using Option 1
- BLN has not provided sufficient information for staff to conclude Option 1 is appropriate
- BLN may need to implement a setpoint control program (SCP) consistent with Option 3 for providing instrumentation system settings
- DCD does not include SCP as an option for providing instrumentation system settings

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SER/OI Chapter 17
Quality Assurance Program

July 23–24, 2009

Staff Review Team

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Project Managers

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- **Manny Comar**, AP1000 Bellefonte COL

Overview of DCA and COL

SRP Section/Application Section		Status	
		AP1000	Bellefonte
17.1	Quality Assurance During the Design and Construction Phases	No OI	IBR with Supplement 3 OI
17.2	Quality Assurance During the Operations Phase	No OI	IBR No OI
17.3	Quality Assurance During Design, Procurement, Fabrication, Inspection, and/or Testing of Nuclear Power Plant Items	1 OI	IBR No OI
17.4	Design Reliability Assurance Program	2 OI	IBR with Supplement No OI
17.5	Quality Assurance Program Description—New License Applicants	No OI	IBR with Supplement 6 OI
17.6	Maintenance Rule Program	No OI	IBR with Supplement No OI
Totals		3 OI	9 OI

Overview of AP1000 DCA Chapter 17
QA Program Description

DCD Section		Summary of Changes to DCA
17.1	Quality Assurance During the Design and Construction Phases	None
17.2	Quality Assurance During the Operations Phase	None
17.3	**Quality Assurance During the Design Phase**	**Proposed use of Westinghouse Quality Management System (QMS) Rev. 5, for AP1000**

Technical Topics of Interest
AP1000 DCA

Section 17.3—Westinghouse QMS

- AP1000 DCD, Revision 17 proposed implementation of Westinghouse Quality Management System (QMS), Revision 5, for AP1000 Projects
  - QMS, Revision 5, previously approved by NRC staff (September 13, 2002)
  - QMS is based on American Society of Mechanical Engineers (ASME) NQA-1-1994.

Technical Topics of Interest
AP1000 DCA

QMS Implementation Inspection

- NRC Inspection of Westinghouse Implementation of QMS, Revision 5
  - Compliance with 10 CFR Part 50 Appendix B and Part 21
  - Three nonconformances identified (design control; control of purchased material equipment, and services; and instructions, procedures, and drawings)
  - Westinghouse developed corrective actions to address and to prevent recurrence of nonconformances
  - Actions reviewed and accepted by staff
- Open Item OI-SRP 17.3-CQVP-01
  - For possible future inspection of Westinghouse QMS implementation

Overview of Bellefonte COL Chapter 17 Quality Assurance

FSAR SECTION		SUMMARY OF DEPARTURES/SUPPLEMENTS
17.1	QA During Design and Construction Phases	IBR **BNL COL 17.5-1 QAP prior to COL issuance**
17.2	QA During the Operations Phase	IBR
17.3	QA Program Description	IBR
17.5	QA Program Description—New License Applicants	IBR Plus SUP **BLN COL 17.5-1 QAP following to COL issuance** STD COL 17.5-2 QAP for procurement, fabrication, installation, construction, and testing of SSCs STD COL 10.5-4 QAP for operations STD COL 17.5-8 RAP integration with QAP

Technical Topics of Interest
BLN COL

QA Program

- Prior to COL applicant using TVA Nuclear Quality Assurance Plan, TVA-NQA-PLN-89-A for oversight of contractors

- Following COL issuance—applicant is following the guidance consistent with RG 1.206 applicable to design, construction, and operations
  - COL FSAR contains a QA program description based on NEI Template 06-14, Revision 4 (NRC approval - April 2007)
  - One open issue regarding incorporation of RG 1.33
  - Resolution through adoption of revisions to NEI 06-14

Technical Topics of Interest
BLN COL

NEI 06-14

- Provides a generic template for ESP and COL applicants to develop a QAP description consistent with the regulatory requirements
  - NEI 06-14, Revision 4
  - Generic issues identified during the review of COL applications is being addressed through future revision of NEI 06-14.
    - * Organization
    - * Applicability of QA Regulatory Guides
    - * Bellefonte (6) open items related to these generic issues

Technical Topics of Interest
BLN COL

QA Implementation Inspections

- In Feb. 2008 the NRC performed limited scope inspection at TVA to verify QA effectively implemented with regard to Simulated Open Channel Hydraulics (SOCH) model (Sections 2.4.3, Probable Maximum Flood on Streams and Rivers, and 2.4.4, Potential Dam Failures.)
  - Violations identified related to design control, software verification and validation, and records control.
  - TVA provided a plan to correct and prevent recurrence of the violations and committed to provide a date when final compliance is achieved.
  - One open item—Follow-up inspection to verify compliance once TVA notifies the NRC that compliance has been achieved.
  - One open item—Perform a limited scope inspection of TVA Appendix B program implementation on suppler oversight and control.

Conclusion

- The NRC staff used the requirements of Appendix B to 10 CFR Part 50 and the guidance in SRP Section 17.5 for evaluating the acceptability of the AP 1000 DCD and Bellefonte COL FSAR Information Items 17.5-1, 17.5-2, 17.5-4 and 17.5-8 in Section 17.5 of the COL FSAR.
- The staff evaluated the QAPDs that will be applied to activities during design, construction, and operations and arrived at the following conclusions pending resolution of the remaining open issues:
  - The QAPDs complies with the acceptance criteria in SRP Section 17.5 and with the commitments to applicable regulatory guidance.
  - The QAPDs provides adequate guidance for the applicant to establish controls that, when properly implemented, complies with Appendix B.
- Questions?

Overview of Chapter 17 Sections on Reliability Assurance

Section		AP1000 DCD	BLN COL
17.4	Design Reliability Assurance Program	2 OI	IBR with supplement No OI
17.6	Maintenance Rule Program	No OI	IBR with supplement No OI

Reliability Assurance Program History

- RAP: cradle to grave
  - D-RAP: prior to initial fuel load
  - O-RAP: from fuel loading on
- OPRAAs instead of O-RAP
- D-RAP subject to ITAAC

Technical Topics of Interest
AP1000 DCA

D-RAP

- D-RAP (a program, not just a list)
- D-RAP ITAAC (changes)
- Changed **basis** for inclusion in D-RAP
- Open item: common-cause failure of RCP circuit breakers (to open)

Technical Topics of Interest
BLN COL

BLN COL D-RAP

- No plant-specific additions
- Handling of post-COL changes to D-RAP

Technical Topics of Interest
Changes in D-RAP

AP1000 DCA

- Items with reduced risk significance (RAW<2) retained, now attributed to the Expert Panel
- OI (resolved): RCP trip breaker basis is RAW/CCF
- Improved D-RAP ITAAC proposed

BLN COL FSAR

- Programs for D-RAP and OPRAAs now explicitly identified
- No additional SSCs
- Design control program & maintenance rule program assure D-RAP adequacy post-COL

Technical Topics of Interest
Maintenance Rule

AP1000 DCD MR program discussed in Section 17.4 cites NEI 07-02

"Generic FSAR Template Guidance for Maintenance Rule Program Description for Plants Licensed under 10 CFR Part 52"

BLN COL FSAR

- Incorporates NEI 07-02A
- Provides schedule for implementation
- Describes support for post-COL changes to the scope of the maintenance rule

Technical Topics of Interest
NEI 07-02A

Maintenance rule program description

- maintenance rule scoping
- monitoring and corrective action
- preventive maintenance
- evaluation of monitoring and preventive maintenance
- risk assessment and risk management

Technical Topics of Interest, NEI 07-02A (continued)

Also addresses

- training and qualification
- program relationship with reliability assurance activities
- program relationship with industry operating experience activities
- implementation

United States Nuclear Regulatory Commission

Protecting People and the Environment

Presentation to the ACRS Subcommittee

Westinghouse AP1000 Design Certification Amendment Application Review
Bellefonte Units 3 and 4 COL Application Review

SER/OI Chapter 19
Probabilistic Risk Assessment and Severe Accidents

July 23–24, 2009

Staff Review Team

Technical Staff

- **Malcolm Patterson**, DCD Lead Reviewer,
  PRA Licensing, Operations Support, and Maintenance Branch 1 (SPLA)
- **Mark Melnicoff**, BLN COL Lead Reviewer, SPLA
- **Marie Pohida**, Reviewer (shutdown/low power),
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- **Ed Fuller**, Reviewer (severe accident mitigation),SPLB
- **Bret Tegler**, Reviewer (seismic margin analysis),
  Structural Engineering Branch 1 (SEB1)

Project Managers

- **Serita Sanders**, AP1000 DCA
- **Manny Comar**, BLN COL

Overview of Chapter 19

- Introduction
- System-by-system descriptions
  - Changed—reviewed for potential effect on PRA
  - Unchanged—already certified; not reviewed
- Other assessments*
  - Severe accident topics
  - Fire PRA
  - Seismic margins analysis
  - External events
  - Results and insights

* reviewed only the changes

Overview of DCA and COL

SRP Section/Application Section		Open Items	
		AP1000	Bellefonte
19.2–7 19.29–33 19.35 19.42–45 19.49–51 19.54 19.56–57	previously considered (PRA Report)	0	IBR
19.46–48 19.52–53	not used	0	IBR
19.8–28	various systems (some DCD internal references)	0	IBR

Overview of DCA and COL

SRP Section/Application Section		Open Items	
		AP1000	Bellefonte
19.1	Introduction	0	IBR
19.34	Severe Accident Phenomena Treatment	1	IBR
19.36	Reactor Coolant System Depressurization	0	IBR
19.37	Containment Isolation	0	IBR
19.38	Reactor Vessel Reflooding	0	IBR
19.39	In-Vessel Retention of Molten Core Debris	0	IBR
19.40	Passive Containment Cooling	0	IBR
19.41	H_2 Mixing and Combustion Analysis	0	IBR
19.55	Seismic Margin Analysis	1	IBR
19.58	Winds, Floods, and Other External Events	1	2
19.59	PRA Results and Insights	3	1
Totals		6	3

Objectives of Review

AP1000 DCD

- FSER safety conclusion still valid
- PRA upgrade/update successful
- Capture new insights
- RTNSS scope still appropriate
- Requirements updated:
  - ITAAC
  - D-RAP scope
  - Tech Specs and availability controls

Technical Topics of Interest

AP1000 DCD

- Design changes
- PRA audit
- Seismic risk
- 10 CFR Part 52 change:
  "...description of PRA and report of results..."

Technical Topics of Interest

Section 19.34. Severe Accident Phenomena Treatment

AP1000 DCD

- Equipment survivability (radiation)

BLN COL FSAR

- IBR

Technical Topics of Interest

Section 19.55, Seismic Margin Analysis

AP1000 DCD

- HRHF sites
- Seismic issues in the DCD
  - seismic margin at frequencies with exceedance
  - modular shield building design
  - soil-structure interaction

BLN COL FSAR

- IBR

Technical Topics of Interest

Section 19.58, Winds, Floods, and Other External Events

AP1000 DCD

- "Generic Site"

BLN COL FSAR

- Summary of external events
- High winds
- Floods
- Transportation and other external events

Technical Topics of Interest

Section 19.59, PRA Results and Insights

AP1000 DCD

- I&C systems
- Reactor coolant pumps
- Reactor vessel insulation system
- PRA configuration controls during design
- Description and results

BLN COL FSAR

- PRA configuration controls after licensing

PRA Audit

- PRA upgrade and update
  - conversion process (CAFTA)
  - new FTs (protection and control systems)
- Integration with the design process
- Qualifications
- Corrective action program