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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

480TH MEETING

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

THURSDAY

MARCH 1, 2001

ROCKVILLE, MARYLAND

The Advisory Committee met at the Nuclear Regulatory Commission, Two White Flint North, Room T2B3, 11545 Rockville Pike, at 8:30 a.m., Dr. George Apostolakis, Chairman, presiding.

COMMITTEE MEMBERS:

GEORGE APOSTOLAKIS, Chairman
MARIO V. BONACA, Vice Chairman
THOMAS S. KRESS, Member
GRAHAM M. LEITCH, Member
DANA A. POWERS, Member
ROBERT L. SEALE, Member
WILLIAM J. SHACK, Member
JOHN D. SIEBER, Member
ROBERT U. UHRIG, Member
GRAHAM B. WALLIS, Member
F. PETER FORD, Invited Expert

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NRC STAFF:

RALPH CARUSO
TIM COLLINS
NOEL DUDLEY
CHRIS GRIMES
BILL HUFFMAN
RALPH LANDRY
RONALD LLOYD
JOHN NAKOSKI
BOB PRATO
HAROLD VANDERMOLLEN

OTHERS PRESENT:

LYNETTE HENDRICKS
ROBERT HENRY

SCHEDULE AND OUTLINE FOR DISCUSSION
480TH ACRS MEETING
MARCH 1-3, 2001

THURSDAY, MARCH 1, 2001, CONFERENCE ROOM 2B3, TWO
WHITE FLINT NORTH,
ROCKVILLE, MARYLAND

- 1) 8:30 - 8:35 A.M. Opening Remarks by the ACRS
Chairman (Open)
 - 1.1) Opening statement (GEA/JTL/SD) . . . 5
 - 1.2) Items of current interest (GEA/SD) 6
 - 1.3) Priorities for preparation of ACRS
reports (GEA/JTL/SD)

- 2) 8:35 - 10:00 A.M. RETRAN-3D Thermal-Hydraulic
Transient Analysis Code (Open/Closed) (GBW/PAB)
 - 2.1) Remarks by the Subcommittee
Chairman 8
 - 2.2) Briefing by and discussions with
representatives of the Electric Power
Research Institute (EPRI) and the NRC
staff regarding the EPRI RETRAN-3D
thermal-hydraulic transient analysis
code, associated staff's Safety
Evaluation Report, and resolution of
issues previously raised by the
ACRS 9

[Note: A portion of this session may be closed
to discuss EPRI proprietary information.]

- 3) Subcommittee Report (Open) (JDS/GEA/MWW)
Report by the Chairmen of the Plant Operations
and Reliability and Probabilistic Risk
Assessment Subcommittees regarding the South
Texas Project Exemption Request that was
discussed during a meeting on February 21,
2001 36

- 4) 10:15 - 11:45 A.M. Interim Review of the License
Renewal Application for Arkansas Nuclear One,
Unit 1 (Open) (MVB/GML/NFD/SD)
 - 3.1) Remarks by the Subcommittee
Chairman 88

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- 3.2) Briefing by and discussions with representatives of the Entergy Operations, Inc. and the NRC staff regarding the license renewal application for Arkansas Nuclear One, Unit 1 and the associated staff's Safety Evaluation Report 92

- 5) 12:45 - 2:15 P.M. Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants (Open) (TSK/DAP/MME)
 - 4.1) Remarks by the Subcommittee Chairman 111
 - 4.2) Briefing by and discussions with representatives of the NRC staff regarding significant findings and recommendations of the final report on spent fuel pool accident risk at decommissioning plants, new developments, status of developing proposed options, and related matters. Representatives of the nuclear industry will provide their views, as appropriate 112

- 6) 2:30 - 3:45 P.M. Management Directive 6.4 Associated with the Revised Generic Issue Process (Open) (TSK/AS)
 - 5.1) Remarks by the Subcommittee Chairman 188
 - 5.2) Briefing by and discussions with representatives of the NRC staff regarding Management Directive 6.4 related to the Revised Generic Issue process, results of the case study performed to determine the effectiveness of using the Management Directive to implement the revised Generic Issue process, and related matters 188

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

8:30 a.m.

CHAIRMAN APOSTOLAKIS: The meeting will now come to order. This is the first day of the 480th meeting of the Advisory Committee on Reactor Safeguards.

During today's meeting the committee will consider the following: RETRAN-3D Thermal-Hydraulic Transient Analysis Code, Interim Review of the License Renewal Application for Arkansas Nuclear One, Unit 1, Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants, Management Directive 6.4 Associated with the Revised Generic Issue Process, and Proposed ACRS Reports.

I would like to note some changes to the agenda. RETRAN-3D and ANO-1 license renewal application were discussed by cognizant subcommittees. As recommended by the chairman of the subcommittees, there will not be presentations either by the staff or by the industry groups on these matters. Instead the subcommittee chairman will provide reports to the full committee. Representatives of the NRC staff will be present to answer any questions from the members.

In addition, the subcommittee report on the South Texas Project Exemption Request scheduled

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1 between 1:00 and 1:30 P.M. on Friday, March 2, will be
2 held today following the subcommittee report on
3 RETRAN-3D.

4 After completing the subcommittee reports,
5 the committee will discuss the proposed ACRS report on
6 the regulatory effectiveness of the ATWS Rule. I hope
7 these changes will not cause any inconvenience to the
8 meeting participants.

9 This meeting is being conducted in
10 accordance with the provisions of the Federal Advisory
11 Committee Act. Dr. John T. Larkins is the designated
12 federal official for the initial portion of the
13 meeting.

14 We have received no written comments or
15 requests for time to make oral statements from members
16 of the public regarding today's sessions. A
17 transcript of portions of the meeting is being kept
18 and it is requested that the speakers use one of the
19 microphones, identify themselves, and speak with
20 sufficient clarity and volume so they can be readily
21 heard.

22 I will begin with some items of current
23 interest. We received from Dr. Powers draft one of
24 the research report on February 26 and some additional
25 sections yesterday. The most recent version of the

1 research report along with assignments for reviewing
2 various sections will be provided to you this morning.

3 Members should not only review the sections
4 assigned to them but also should review the entire
5 report and be prepared to provide their views during
6 the discussion of the report this evening.
7 Representatives from the Office of Research will
8 attend the meeting to respond to questions from the
9 members.

10 I would also like to bring the members'
11 attention to this pink items of interest report, in
12 particular items referring to management changes.
13 There have been some senior management changes.

14 Also to the announcement that the NRC will
15 hold a workshop on the initial implementation of the
16 reactor oversight process on March 26. Also the
17 agenda and registration information for the NRC 13th
18 Annual Regulatory Information Conferences included in
19 this document.

20 I think we are ready to start the meeting.
21 The first item on the agenda is RETRAN-3D Thermal-
22 Hydraulic Transient Analysis Code.

23 Dr. Wallis, will you guide us through this
24 and give the report to the committee.

25 DR. WALLIS: Thank you, Mr. Chairman. We

1 met on the 20th of February, last week, with
2 representatives from EPRI and from industry, the users
3 of EPRI code RETRAN.

4 Finally, with the technical folks who are
5 consultants for EPRI who actually put together the
6 code. We actually this time had discussions of
7 technical matters which had eluded us two years
8 previously and for some time in between.

9 Mr. Swindelhurst from the users gave us the
10 familiar story, RETRAN is being widely used, ACRS
11 concerns have been addressed, and everything is fine.

12 We then turned to Mark Polson, the technical
13 man. He made a technical presentation. Before long
14 he realized that our critique had some merit. He said
15 things like, "Oh, I see where you're coming from," and
16 expressions like that which it was quite nice to hear.

17 After this had gone on for an hour or two,
18 the new program manager from EPRI who wasn't here the
19 previous time, Jack Prahl, asked to make a statement
20 and he essentially wished to admit that there were
21 problems with this code and EPRI had something to fix
22 up.

23 Then we went on with more technical details
24 and more discussion with Mark Polson and he saw even
25 more clearly some of the places from where we were

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1 coming. It was decided from the results of these
2 discussions that it would not be appropriate for EPRI
3 to make a presentation today before the full committee
4 which was originally planned.

5 That's a brief overview of what happened
6 last week.

7 Now, I think it will be good for this
8 committee to discuss quite a few points raised or
9 lessons learned from all this. I'm sure you have some
10 other than the ones I wish to point out at this time.

11 First one is the ACRS role. It seems that
12 without the willingness of the ACRS to actually look
13 at equations and question them, none of this might
14 ever have happened. One wonders if it really should
15 have to come to the ACRS in order for this sort of
16 review of equations to occur.

17 The staff has issues with the SER
18 and one might wonder what the mechanism is now for
19 closing the loop on these issues. Will the
20 documentation have to be changed since the code
21 reflects the documentation?

22 And since the problem with the RETRAN
23 momentum equation is the supposed resolution, if the
24 momentum flux turns in arbitrary direction psi which
25 leads to peculiar results, this presumably is in the

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1 code. Will the code have to be changed? If the code
2 has to be changed, the evaluations of the code will
3 have to be rerun and so on. There are a lot of issues
4 about what should happen now.

5 The shorter-term issue for us is what should
6 we do now. I understand the latest proposal is that
7 this committee write Larkins a very short letter --
8 you may even have the draft of it here -- and append
9 the two documents that I prepared, the tutorial on the
10 momentum equation and the detailed critique of RETRAN
11 which doesn't necessarily capture everything in there
12 which might need examination and change.

13 I think my colleagues might consider at this
14 point what we are aiming at as a resolution of these
15 matters. What do we hope to change? Do we hope to
16 change the way things are done around here? Do we
17 want to change the way reviews are performed? Do we
18 want to change substantially the standards required
19 for code documentation?

20 Do we want to change RETRAN code itself?
21 What is it that we hope to achieve by our actions
22 today and in the future on this code and other codes?
23 There are several questions. Maybe the chair would
24 like to decide which ones to take up first.

25 CHAIRMAN APOSTOLAKIS: I'm not sure this is

1 the appropriate time to do this. We will perhaps
2 revisit these questions when we draft this short
3 letter and decide what the attachments should be.

4 DR. POWERS: I wonder why you think it's not
5 the appropriate time.

6 CHAIRMAN APOSTOLAKIS: This is supposed to
7 be a short proposal. The questions that Dr. Wallis is
8 raising are require a lot of discussion.

9 DR. WALLIS: The staff is or are here,
10 depending on grammar. There are members from the
11 staff here and this is your chance to have a
12 discussion with them about perhaps how we got here and
13 where we go from here.

14 CHAIRMAN APOSTOLAKIS: It seems to me that
15 regarding the code we have to make sure it's correct.
16 But the other questions you're asking, where do we
17 want to go and whether we want to make proposals
18 regarding the review process, I mean, I don't think
19 this is the right time to discuss that.

20 DR. POWERS: It seems to me that the review
21 process itself is pretty good. I mean, I am impressed
22 at all the things that are going on, getting the code,
23 running it, very carefully going through all the
24 things like that.

25 Now the question of the documentation and

1 what not, it seems to me it's not a change. It's
2 simply exercising and reinforcing the standards in the
3 technical community in general.

4 The documentation simply has to accurately
5 reflect what is done in the code and has to be
6 technically correct. You cannot have scalar
7 quantities treated as vectors. That's just
8 unacceptable, or vice versa.

9 CHAIRMAN APOSTOLAKIS: There are bigger
10 issues here, though. I think that's what Graham
11 implied. Why did it come to ACRS having to check the
12 equations and find that they were not appropriate and
13 so on? That should have been done somewhere else in
14 the process. Is it the job of this committee to check
15 equations and find mistakes?

16 I think that is an issue that we certainly
17 need to discuss and maybe try to come up with some
18 recommendations to the commission that will correct
19 the process because we should be reviewing whatever we
20 like but it seems to me that, you know, this should
21 not be the place where errors of the type that Dr.
22 Wallis identified should be found.

23 In that sense I don't think it's appropriate
24 to discuss these bigger issues. But we definitely
25 want to make sure that there is documentation of the

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1 concerns and so on. This is simply intended to
2 document these concerns.

3 Dr. Wallis has transmitted to us two reports
4 that are in the handout No. 2, the first two, Comments
5 on EPRI Response to RAI and Other Recent Submittals
6 Concerning the RETRAN Code dated February 25 of this
7 year. The second one is Tutorial on Momentum
8 Equations dated January and February of this year.

9 The thought was simply to write a short
10 letter to the EDO transmitting these two documents at
11 this time. That's all the action we're going to take
12 and wait for EPRI response.

13 Is that correct, Graham?

14 DR. WALLIS: Maybe you don't want to do it
15 now but I think we have to have some idea of where we
16 think things are going and where they ought to go
17 because if we wait, we don't know what we're going to
18 get. We may get off on some track which isn't going
19 in the direction we would like things to go.

20 CHAIRMAN APOSTOLAKIS: Like which way?

21 DR. WALLIS: I don't know. This committee
22 needs to decide what its role is. We could stand back
23 and say we've given our input. Now we'll wait and
24 see. Whatever comes back, we'll respond to that when
25 we see it.

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1 Or we could give more indication of where we
2 would like things to go and what we would regard as a
3 suitable resolution of the issues so that when folks
4 come back to us, whenever they do come back to us, if
5 they come back to us, with what they think is a
6 resolution of the issues, that they don't find that
7 our expectation was something different.

8 CHAIRMAN APOSTOLAKIS: Would you raise these
9 issues and reflect our thoughts on the matter in the
10 letter?

11 DR. WALLIS: No. I think we should probably
12 discuss this at some other time, George, than in this
13 meeting.

14 CHAIRMAN APOSTOLAKIS: That's what I'm
15 saying. That would make a very difficult letter.

16 DR. WALLIS: Since we have two members of
17 the staff here, do we want to ask them about the
18 mechanism for closing the loop?

19 This is something that Virgil Shrock raises
20 rather strongly in his comments is that we go through
21 all these motions but the SER is out there and unless
22 somebody follows up on these things the issues may
23 just fade away and people get tired of them and
24 nothing will happen. What is the mechanism for what
25 one could call closure on these issues?

1 DR. LANDRY: Mr. Chairman, Ralph Landry, NRR
2 staff. As we discussed with the subcommittee, our
3 position at this point is we have prepared an SER
4 based on the documentation which we received on
5 RETRAN-3D.

6 Now, since we have been involved very
7 heavily with the subcommittee in the review of the
8 code, the errors in the documentation that was
9 presented on the momentum equation, we've expressed
10 our view that the approach that was taken in preparing
11 this documentation was very difficult to understand
12 and very difficult to follow through.

13 EPRI attempted to derive a momentum equation
14 from basic principles and in that process ended up
15 with material that was very hard to follow through
16 and, quite frankly, we would agree with Dr. Wallis
17 that it's highly suspect and there are errors in it.
18 We pointed out a number of errors to EPRI and their
19 consultants ourselves in addition to the errors that
20 Dr. Wallis pointed out.

21 Our suggestion in front of the subcommittee
22 was that the documentation should be retracted and a
23 presentation should be made of what is in the code
24 with regard to a motion equation, momentum equation,
25 however you want to term it, what are the terms in

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1 that equation, what do they represent, and how can
2 they be justified rather than a derivation from basic
3 principles.

4 EPRI in their presentation to the
5 subcommittee indicated, as Dr. Wallis said, that they
6 recognized the problems in what they had in the
7 documentation. They were going to go home and do some
8 further work.

9 At this point the staff is waiting to see
10 what that further work is because we don't want to
11 dictate to them what they should put in the
12 documentation. It's their job to come up with the
13 documentation. We want to see what is in that
14 documentation, is it correct, and is it in acceptable
15 form.

16 At that point we would entertain the idea of
17 writing an addendum or a supplement to our SER. We
18 have done that in the past. In the years gone by in
19 code reviews there have been numerous SERs which had
20 supplements and addenda written to them which
21 explained further information or evaluated further
22 information that had been received. We would be more
23 than willing to do so should they provide information
24 that is reviewable that would correct what we see as
25 shortcomings in the documentation today.

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1 That's the approach that we're on on RETRAN.
2 Some of the other points that Dr. Wallis has brought
3 out are a bigger picture discussion and those I think
4 we need to discuss more fully and how we approach
5 these reviews.

6 From the perspective of the staff, the
7 review that has been undergone in the code in the
8 recent two years with the TH subcommittee has been
9 very good and very fruitful. We've had a very good
10 relationship and very good interchange of information
11 with one another and this has been a great benefit to
12 the staff.

13 In this process we have been writing a draft
14 standard review plan and draft regulatory guide on
15 code and code review. This has been in itself an
16 educational process. We've learned a great deal from
17 these code reviews and from the interactions with the
18 subcommittee.

19 DR. WALLIS: Let me ask you about the code
20 itself. Just to pick one thing out of my critique
21 here, they have an analysis of a bend. If you throw
22 out the friction turn and it's a smooth bend, it turns
23 out the way they formulated it, there's a pressure
24 rise across the bend for no cause.

25 If you add these bends together, you've got

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1 a pump with no moving parts and no energy input which
2 doesn't seem very desirable. If these features are in
3 the code itself, you have to after the code, not just
4 the documentation.

5 DR. LANDRY: That's correct and that is one
6 of the problems that we also pointed out and point out
7 in the SER, that you don't get an effect as their
8 equations would indicate. It would be a very creative
9 piece of equipment. It's almost a perpetual motion
10 machine that they have created in their derivation.
11 It would be very nice to see if they could build one
12 of these. That's a little sarcasm.

13 DR. WALLIS: They could have a dot com
14 company which would flourish for a while.

15 DR. LANDRY: Until they went bankrupt.
16 Typical dot com. That gets back, Dr. Wallis, to the
17 point I was trying to raise a few minutes ago. The
18 approach that we think would be far more fruitful and
19 beneficial would be to show what is in the code,
20 explain what is in the code, and why what is in the
21 code is correct and acceptable.

22 Right now we're going down one path with
23 documentation and that may not match up with the code.
24 We keep saying to the applicant, "You should come back
25 here and explain the code and why the code is

1 acceptable. What is in the code, not necessarily what
2 is in the documentation.

3 MR. LEITCH: Dr. Landry, could you explain
4 what is the status of the SER now and what use would
5 be made of the SER where we are at this point in time?

6 DR. LANDRY: The SER has been issued to the
7 staff and I believe the SER has been released into the
8 public sector by the project's office. That means
9 that those who would like to use RETRAN-3D can come in
10 and reference the SER.

11 But that doesn't mean that anyone
12 referencing the SER and RETRAN-3D is completely clean.
13 There are 45 conditions and limitations stipulated in
14 the SER on RETRAN-3D which puts a severe restriction
15 on anybody using the code in that they must come in
16 and justify every option chosen.

17 In most applications of the code provide
18 adequate assessment because the assessment is so thin
19 in the documentation for the application of the code.
20 That puts a great deal of onus on anyone who wants to
21 use the code in that they must completely justify what
22 they are doing. They must justify the code.

23 MR. LEITCH: But even with that
24 justification there would still be another cloud over
25 that work.

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1 DR. LANDRY: At this point there is in that
2 we are very concerned about what is actually in the
3 code now. This issue has been raised and we are
4 flagged when anything comes in referring to this code,
5 that indeed we must understand what is in the code
6 first.

7 MR. LEITCH: I was just wondering if
8 licensees might be spending a great deal of effort
9 developing work in this regard only to find that it's
10 unacceptable.

11 DR. LANDRY: At this point we are not aware
12 of a number of our licensees using the code for a
13 licensing application. There is one licensee that has
14 submitted a reference to RETRAN-3D but that was to use
15 RETRAN-3D in a RETRAN-02 mode as a substitute for the
16 old version of RETRAN.

17 We have put very strict stipulations on how
18 that can be done within the SER. Only one who has
19 been approved for use of RETRAN-02 can use RETRAN-3D
20 in a RETRAN-02 mode and then we specified what that
21 entails.

22 The applicant in question is not a licensee
23 who is approved for use of RETRAN-02. So that raises
24 an issue in itself and we simply ask that licensee to
25 demonstrate how they satisfy all conditions and

1 limitations stipulated in RETRAN-3D SER. When they
2 get to the stipulation that they have to be approved
3 for RETRAN-02 to begin with, they are going to run
4 into a road block.

5 DR. BONACA: I had a question about what are
6 the genetic implications of these findings to other
7 codes such as RELAP-5, such as TRACK, that are being
8 used now for best estimate calculations? I mean, do
9 we expect to see the same kind of issues or problems
10 there?

11 DR. LANDRY: In this discussion a number of
12 issues have come up with the formulation of momentum
13 that point back to work that was done back in 1974 and
14 even before. The issues at that time that were
15 brought up pertained to the formulation of momentum
16 for the RELAP-3 and RELAP-4 codes which are the basis
17 for RETRAN family codes which actually goes even
18 further back. It goes back to FLASH. RELAP-3 came
19 from FLASH.

20 This issue so far after looking at the other
21 codes would not apply to the RELAP-5 and TRACK family
22 because those codes started from a different
23 derivation and different basis.

24 They drew on the work on RELAP-4 but the way
25 in which they constituted the continuity equations was

1 different than was in the older versions of the RELAP.
2 We have not gone back and checked exactly what's in
3 there but the formulation is different for the newer
4 versions of the codes.

5 DR. BONACA: I believe it would be
6 appropriate at this time to look back into those codes
7 and see if the same issues apply just because, I mean,
8 clearly, I agree with you, there is a totally
9 different formulation.

10 DR. LANDRY: We did raise that issue when we
11 were doing the Siemens S-RELAP-5 review for an
12 Appendix K application to small break LOCA. That
13 question came up because of typos and other errors we
14 found in the documentation.

15 One of the lead engineers that they now have
16 at Siemens came in and gave a cogent, very good
17 explanation of what is in the code and justification
18 for the way momentum is formulated in the S-RELAP-5
19 which is going to be the same essentially as the
20 RELAP-5 code.

21 Their explanation was far more justifiable
22 and indicated that far greater support for the
23 formulation of momentum that they have than we can
24 point to at this point in the RETRAN codes.

25 We don't know absolutely that what is in the

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1 RETRAN family is wrong. What we have in the
2 documentation is not supportive of it.

3 DR. WALLIS: Apparently the code is based on
4 the equations and equations have this strange way of
5 resolving momentum fluxes which led to this pressure
6 rise around the bend which seems, since you have the
7 code, you could look at how they model bends they made
8 in piping, loop seals and things.

9 We had a discussion with them which was
10 inclusive of how they model the cold laid down comma
11 transition which is a bend in there, we're looking at
12 it, and they had some very strange terms in that one.

13 It is possible to look in the code and say
14 what does the code actually have. You may be
15 surprised. The code may have something else. But if
16 the code reflects the documentation, then presumably
17 these bends are doing the same sort of thing that the
18 bend in the documentation was doing actually in the
19 code.

20 DR. LANDRY: We would agree with you, Dr.
21 Wallis, and that's why we've said that our
22 recommendation to the applicant is that they explain
23 what is in the code and justify it. Generally when a
24 code of this nature is used, you don't actually model
25 bends and calculate angles and change in flow

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1 direction but you but nodes together with junctions
2 where you have a farm lot.

3 DR. WALLIS: RETRAN makes a big thing about
4 not having that. They actually have size and
5 mysterious things which enable them to handle things
6 like bends.

7 DR. LANDRY: We've asked for this to be
8 explained.

9 DR. WALLIS: It would be very strange if
10 they have in documentation all this new theory about
11 bends and the code is still the old straight pipe
12 junction.

13 MR. CARUSO: Dr. Wallis, this is Ralph
14 Caruso from the Reactor Systems Branch. I think
15 listening to all this discussion I would like to
16 inject a little bit of, I'm going to say, brutal
17 honesty here. We don't really believe there's a
18 problem with the RETRAN code itself. We believe that
19 the problem is the documentation.

20 The RETRAN-3D is a transition code. It's a
21 new version of the RETRAN family and because the
22 RETRAN community is trying to take the user community
23 and bring it along to a new version of the code, they
24 had to come out with something that they thought would
25 be attractive to the existing users.

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1 We believe that unfortunately in developing
2 the documentation they attempted to describe it in
3 terms which give it more credence than it necessarily
4 deserves. They oversold it a bit.

5 DR. WALLIS: This is a strange statement.
6 You mean the actual practice has no relationship to
7 the theory?

8 MR. CARUSO: We believe that the way the
9 code is set up -- as Ralph said, the problem is the
10 documentation does not reflect what's in the code.
11 The code and the documentation don't agree.

12 The documentation attempted to derive the
13 momentum equations from first principles and show how
14 they were applied in the code. Unfortunately, they
15 are not applied that way.

16 DR. WALLIS: It almost implies that the ACRS
17 should recompile.

18 MR. CARUSO: Well, this goes back a little
19 bit further to, I guess you could say, the strategy
20 for doing this code review from the start.

21 We understood that the underlying structure
22 of the code was essentially the same as RETRAN-02 and
23 we made a conscious decision at that point that we
24 were not going to review that underlying structure and
25 those underlying equations.

1 The existing code, that structure, had been
2 reviewed, had been approved, and has been in use for
3 a large period of time and it generally seems to
4 produce reasonable results that can be used by people
5 to analyze the behavior of the plans.

6 DR. WALLIS: How long is this reasonable
7 comparative time?

8 MR. CARUSO: Oh --

9 DR. WALLIS: Is it 20 years?

10 MR. CARUSO: Something on the order of 20
11 years. The documentation that's cited in RETRAN-3D is
12 very much like the documentation. RETRAN-3D is 20
13 years old. It's an old report from INEL, I think. Is
14 that what you're referring to?

15 DR. WALLIS: No. What I'm referring to is
16 the documentation that you saw for RETRAN-3D as new
17 documentation.

18 MR. CARUSO: It's very much the same as was
19 in the 20-year-old document from Idaho. Same sort of
20 treatments of bends and things there. It hasn't
21 changed.

22 DR. BONACA: What concerns me is that there
23 was a departure from RELAP-4 when RELAP-5 was
24 developed. Unless the agency was totally wasteful
25 with its money, it was done intently because it was

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1 recognized that RELAP-4 was not capable of being a
2 good prediction code. Is this correct?

3 I mean, that's the history of that time.
4 That's why there was a departure. My concern is that
5 whatever you do to patch up RETRAN, which is a
6 derivation of RELAP-4, you may not be able to achieve
7 what you want, achieve in a prediction fashion for the
8 very reasons that led the whole industry and the
9 agency to go to RELAP-5 to develop all new formulation
10 of these equations.

11 My concern is that here we have -- I'm
12 expressing this concern because this has been
13 discussed with EPRI for 20 years, this attempt to
14 bring RETRAN from RETRAN-1 to RETRAN-2 and now to
15 RETRAN-3D. Next maybe RETRAN will do neutronics or
16 who knows what.

17 I mean, is there something mentally wrong
18 about attempting to take this code and make it do
19 things it cannot possibly do? The reason why I say
20 that question is that Professor Wallis brought up some
21 fundamental issues there. I'm not sure that purely by
22 changing somewhat the algorithm psi and putting some
23 correction in terms will solve this issue.

24 DR. SHACK: Although I think it is true,
25 what's unique about RETRAN is the introduction of the

1 psi angle and the attempt to apply a one-dimensional
2 momentum equation to a 90 degree angle.

3 I think probably as long as the modeler
4 avoids that option, it really does essentially
5 adjunction the model. Those applications are probably
6 okay.

7 What you worry about is the occasion when he
8 actually tries to use that feature that he can take
9 the momentum 90 degrees to the angle to which he
10 thinks he's writing a one-dimensional equation. I
11 suspect that is largely why the code works is that
12 people by in large don't use that feature.

13 It kind of floats in there because, I mean,
14 it's wrong. They fixed up one set of terms but
15 they're not the worse because the cosine squared term
16 isn't the problem. It's either zero or one so whether
17 it's cosine or cosine squared doesn't make much
18 difference. They have a missing cosine.

19 DR. BONACA: The problem with that --

20 DR. SHACK: It's zero and one.

21 DR. BONACA: The problem with that is this
22 places the burden on the issuer and the issuer is not
23 typically an expert in the code.

24 DR. SHACK: I agree that is a problem, why
25 one set of codes is really different. I think that is

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1 the unique feature of RETRAN is to introduce this
2 notion that you can apply a one-dimensional momentum
3 equation 90 degrees. That makes it different.

4 DR. BONACA: I knew that.

5 DR. SHACK: The reason it probably works
6 much of the time is you don't try to do it too often.

7 MR. CARUSO: It is also important to
8 understand that we know that this situation exist and
9 the question was asked, well, how does this get fixed
10 in the future? How do we know that someone doesn't
11 make a mistake?

12 The staff process for approving the use of
13 these codes has several steps. The first step we've
14 just gone through is to improve the generic topical
15 report but then each application has to be reviewed
16 and approved specifically by the staff. We do ask for
17 copies of the actual plant models as part of those
18 approvals.

19 The staff will actually see the models that
20 will be used by the RETRAN users when they want to
21 apply them to their plants. Now that we are aware
22 that this situation occurs, we can be alert to it and
23 say, "Well, wait a minute. How are you modeling this
24 1-D momentum through 90 degrees in your plant model?"

25 DR. WALLIS: But you still have a problem.

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1 Which psi will you accept? No psi is really right.

2 MR. CARUSO: Actually zero.

3 DR. WALLIS: No psi is really right.

4 MR. CARUSO: From our understanding of the
5 way the RETRAN users actually use the code, they don't
6 use that factor. They just put in form losses at the
7 junctions.

8 DR. WALLIS: But they have to. You have to
9 put in something for your momentum flux terms and
10 something for your inertias terms. The L1s and L2s
11 themselves, there is a question about how they fit in,
12 too, when you go around a bend.

13 There are all of these questions about how
14 this fundamental equation is used for various
15 components. Are you going to examine every component
16 in the reactor to see if they use the psi and which
17 one did they use, if they used L1 or L2, and how did
18 they choose it and all that.

19 MR. CARUSO: Actually, the EPRI people have
20 also made a commitment to have the new users of
21 RETRAN-3D submit their models to peer review panels so
22 that there will be experienced users that look at the
23 models that are developed to make sure they are not
24 doing things in a too creative way.

25 DR. WALLIS: I guess there was a concern

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1 that the consultants, particularly Novak Zuber, who
2 has been around us for four years or so, if you don't
3 go after some of these conceptual problems when you
4 review the codes, errors get embedded and they go on
5 for decades.

6 I don't know how you fix that but if you
7 back off or if you say we'll fix it when it comes to
8 a given utility using and so on, then this blemish
9 stays there and will resurface again. You have to
10 deal with it forever.

11 DR. LANDRY: That, I think, is one of the
12 points that Ralph Caruso was referring to a moment ago
13 that, yes, RETRAN-02 was reviewed and approved. The
14 way we approached the RETRAN-3D review initially was
15 we would look at the material that was new and
16 different from RETRAN-02.

17 Rather than expend resources on reviewing
18 the old code, we would only look at the new material.
19 During the course of this review in all these
20 discussions we've had, we found that we had to go back
21 and look at the old material also.

22 This is part of the learning process we've
23 been going through in these reviews in the past two
24 years. Perhaps what seemed like the expedient thing
25 for use of resources to only look at new material is

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1 not the way we should approach the reviews.

2 We should be a little more sensitive to a
3 code of this nature looking at the older material, the
4 older version of the code also and take into
5 consideration that perhaps there are things in the
6 review of the old code that need to be re-reviewed as
7 we move into the new version of the code.

8 That's quite different than when we receive
9 a brand new code that we haven't reviewed because
10 there we would want to look in detail at the entire
11 code. This is a way we have approached reviews in the
12 past. We have continued doing this code looking at
13 only the new material.

14 Now we realize that perhaps that isn't the
15 best way and that we do have to look at old material,
16 too, so we don't perpetuate a problem from version to
17 version simply because it's been grandfathered in.

18 MR. CARUSO: And to be honest with you,
19 these problems exist in the plants. We have plants
20 now that were licensed back in the '60s and the way
21 they did things back then is not the way we would have
22 them do them now.

23 When we have new license issues come in for
24 those plants, we don't restart the entire review of
25 the plant from ground zero. We make a conscious

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1 decision to limit the scope of our review.

2 I understand the problem of grandfathering
3 in decisions which seem to be a good idea at the time
4 but which in 20 years hindsight may not be appropriate
5 for current times. We don't have the resources to
6 review everything from ground zero every time we have
7 a change to it. We just can't do that.

8 DR. BONACA: But even for all the plants if
9 you find a fundamental problem, you reopen the issue,
10 right?

11 MR. CARUSO: The issue is what is a
12 fundamental problem? In the case of RETRAN it does
13 model the behavior of the plant reasonably well, well
14 enough to make a decision. The question is is it
15 doing for the right reason. Is it doing it for a
16 technically defensible rigorously defensible reason or
17 is it a simplification? How simplified can these
18 equations be before they become undefensible?

19 DR. BONACA: But isn't a determination you
20 have to make before you make a decision?

21 MR. CARUSO: But it's a judgment decision
22 and right now what we've been going on is do the
23 results look reasonable. Can somebody who is
24 reasonably knowledgeable use this code to produce an
25 analysis of the plant behavior.

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1 Although there is a problem with the
2 documentation, we believe that the code as used by
3 those users still gives reasonable results.

4 DR. WALLIS: Maybe we've said enough at this
5 time on this issue.

6 CHAIRMAN APOSTOLAKIS: Now, regarding the
7 other issue you raised, which direction we want to go,
8 maybe we ought to discuss this at another time after
9 perhaps you give us some options based on your
10 experience. You obviously have thought about it.
11 It's always good to have a structured discussion,
12 especially among 10 people to have some structure,
13 some starting point. Would you be willing to do that?

14 DR. WALLIS: Do you think we would do it
15 this Saturday if we're still here?

16 CHAIRMAN APOSTOLAKIS: We may start this
17 Saturday because let's not forget we have huge task to
18 complete at this meeting, namely the review of the
19 research report. I'm not sure we will be ready by
20 Saturday. Again, all I'm asking is two or three
21 lines. It's not a major understanding.

22 Any other comments on this issue from any
23 members?

24 Thank you very much, gentlemen.

25 We can proceed now with the chairman's

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1 report on the South Texas Project Exemption Request.

2 It was a joint meeting of the plant
3 operations and reliability and risk assessment
4 subcommittees. Mr. Sieber, chairman of the plant
5 operations subcommittee, will take the lead on this
6 and I will jump in as necessary.

7 MR. SIEBER: Actually, since these 10
8 members were present for the joint subcommittee
9 meeting, all this will be sort of a review as opposed
10 to new material.

11 I guess I viewed this whole process from an
12 operating standpoint as opposed to a PRA standpoint.
13 The meeting that we had on the 21st involved the
14 process, the element of categorization. We all got a
15 packet of material on February 8 which most of my
16 remarks are based on that packet of information.

17 My approach to doing these things is
18 actually to first look at the plan itself and try to
19 compare the numbers and logic that they use versus my
20 memory of how these plants actually go together. I
21 used the NRC database to look at the characteristics
22 of the plant.

23 There are two units there. They are 4 loop
24 PWRs. They are large units rated at 1250 MW
25 electric. It's owned by Houston Power and Light.

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1 It's about 80 miles from the city of Houston. It's a
2 lake cooled plant and it does have some unusual
3 features that affect its risk profile.

4 One is that it has three safety trains
5 including three diesel generators which most plants
6 have two safety trains. The safety trains starting
7 from cold shutdown going up to the high pressure
8 systems includes three RHR systems, three low-head
9 safety injection systems, three intermediate head
10 safety injection systems and what you would ordinarily
11 think of as high-head safety injection there is
12 actually charging pumps.

13 There are three of those even though from an
14 accident standpoint I would discount one because it's
15 a positive displacement pump 35 gallons a minute which
16 I don't think help you much in an accident situation.

17 DR. POWERS: It's worse than that, Jack. It
18 would probably hurt you in an accident situation.

19 MR. SIEBER: It's there and drawing power
20 and doing nothing.

21 DR. POWERS: And it's putting the reactor
22 into hot clad.

23 DR. UHRIG: Jack, am I correct in
24 remembering that this is sort of a unique plant that
25 has a longer core than the standard Westinghouse 4

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1 loop plant? This is different than almost all other
2 4 loop plants?

3 MR. SIEBER: I think it's another foot
4 longer.

5 DR. UHRIG: Yeah. Yeah.

6 MR. SIEBER: It has more elements, for
7 example, by about 32 elements than a 3 loop plant
8 which has about 157 elements in it.

9 DR. UHRIG: You know, the SNUPS design was
10 the standard plant of that era.

11 MR. SIEBER: Right.

12 DR. UHRIG: I believe this one was supposed
13 to be the next generation plant.

14 MR. SIEBER: Right. And it is lake cooled
15 which is not unique in the United States. There are
16 an awful lot of lake cooled plants. It has large dry
17 containment.

18 Now, the exemption request itself, as I see
19 it, it's purpose is to identify components that are
20 important to safety from a risk standpoint and
21 eliminate components not important to safety from the
22 requirements of Title 10 CFR, Part 50, Appendix B and
23 Special Treatment Requirements. I see 50 isn't on
24 there.

25 The other thing is that it is also designed

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1 to identify components which are risk significant but
2 don't end up on the Q-list so that they can be added.
3 This process actually goes both ways.

4 I tried to look at the number of components
5 that they had. Of course, they listed their totals as
6 for both units and specifically for 29 systems. A
7 typical PWR might have anywhere from 50 to 60 systems,
8 but there is no point in trying to categorize safety
9 related or nonsafety, things like drinking water,
10 building ventilation and so forth.

11 The ones that have some significance at all
12 are the 29. If you look at this in a typical BWR, a
13 single unit, it will have about 17,000 valves, another
14 17,000 circuit breakers or electrical components,
15 motors and so forth, about 300 pumps and about six
16 other heat exchangers, and a myriad of other things
17 which for two units would be about 70,000 total
18 components in the plant that are assigned mark numbers
19 of one sort or another.

20 In the 29 systems there are 43,690
21 components in the two units. If you would look at
22 their Q-list, those items falling under the
23 requirements of Appendix B, there are 16,715
24 components listed there. These are the ones that are
25 initially identified either by the nuclear steam

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1 supply system vendor or the architect engineer for the
2 interfacing systems.

3 CHAIRMAN APOSTOLAKIS: These are safety
4 related?

5 MR. SIEBER: These are safety related
6 components as originally determined when the plant was
7 built.

8 CHAIRMAN APOSTOLAKIS: And there are no
9 other safety related. This is it.

10 MR. SIEBER: This is it.

11 DR. WALLIS: This is the total for two
12 units?

13 MR. SIEBER: That's total for two units.

14 DR. WALLIS: So 16,715 is an odd number.
15 That means that something is gone?

16 MR. SIEBER: Yeah. For example, some
17 systems are shared and some are not. I know of no two
18 units regardless of how they were built that are
19 identical.

20 DR. SHACK: The Inside NRC article on this
21 made a comment that South Texas dumped more stuff on
22 the Q-list than the typical plant does. They sort of
23 hit this thing at the peak.

24 MR. SIEBER: Well, Appendix B come out in
25 the early '70s and ours was one of the first plants to

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1 have to adopt Appendix B after construction was
2 underway and the design was done. Our Unit 1 had
3 something like 4,000 or 5,000 items on the Q-list.

4 Unit 2, which was built a year before South
5 Texas and went commercial, had the broad range and had
6 about 7,000 items. There was a growth in what ended
7 up on the Q-list of about, I would say, 35 percent
8 over that time period.

9 DR. POWERS: I believe South Texas in the
10 time it was in construction was one of those plants
11 that benefitted from increased management attention.

12 MR. SIEBER: Don't we all.

13 Now, based on what I have learned, a typical
14 PRA really covers about 2,400 components per unit.
15 That leads to some interesting things. When you try
16 to re-categorize all these items that are on the Q-
17 list, you actually find out that you can only do that
18 on the basis of PRA results for 5.7 percent of those
19 items.

20 If you want to do the remainder, the only
21 choice that you have is to do it by expert panel
22 elicitation which amounts to 94.3 percent. I guess
23 that makes my eyebrows go up a little bit when I think
24 about the fact that categorization is "risk informed"
25 based on PRAs. In my mind, less than 6 percent of the

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1 items are based on the PRA. Everything else is based
2 on the expert panel.

3 CHAIRMAN APOSTOLAKIS: No, but I think that
4 is some additional elaboration that is required here.

5 MR. SIEBER: Okay.

6 CHAIRMAN APOSTOLAKIS: I don't think you
7 mean that because it's not just the numbers. I mean,
8 it's not the 5.7 percent of SSC in the PRA and the
9 remaining 94.3 are not. The 5.7 percent are there
10 because they are important to the CDF and LERF. I
11 mean, there is a reason why they are there and the
12 others are not.

13 MR. SIEBER: Well, you've got to go beyond
14 that because the others may, one way or another, be
15 implicitly a part of the ones that are specifically
16 listed.

17 CHAIRMAN APOSTOLAKIS: Very good point.
18 Yes.

19 MR. SIEBER: On the other hand, you can't go
20 back and do a Fussel-Vesely or RAW for an item that's
21 not there.

22 CHAIRMAN APOSTOLAKIS: Exactly. Exactly.
23 I think, in other words, we should not be talking only
24 in terms of the numbers. We should elaborate a little
25 bit on that.

1 The other point is that, yes, it does appear
2 that the remaining 94 percent are really categorized
3 not using risk information but it was pointed out by
4 the STP folks when they were here that the reason why
5 they called it risk informed is because the whole
6 context within which the characterization takes place
7 is risk informed.

8 The fact that these are not in the PRA is
9 already useful information to the panel because there
10 is a reason why they are not in the PRA. You're
11 right. I mean, it's not as formal as using the
12 importance measures, for example, because you can't do
13 it.

14 DR. POWERS: But, George, I think what he's
15 saying is something more important there. There is
16 not a case that there is a reason they are not in the
17 PRA. There are two reasons, two general categories of
18 reasons.

19 One, it's not important, and the other one
20 is that it's implicitly present and the PRA analyst in
21 order to simplify his model didn't call it out. I
22 mean, that seems to me that's a very significant
23 point.

24 MR. SIEBER: Well, and I think you have to
25 go a step beyond that, too. When we get finally to

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1 the explanation of how the expert panel does its
2 business, there is actually risk information in the
3 questions that they ask and the weighting factors.

4 In a way it's risk informed but as I still
5 see it, it's less than 6 percent come directly from
6 the PRA.

7 CHAIRMAN APOSTOLAKIS: It's not risk
8 informed if you interpret risk informed using strictly
9 numbers.

10 MR. SIEBER: That's right. These are the
11 numbers here related as --

12 DR. BONACA: Just before you go past that,
13 all that I've heard here is true. The only thing I
14 want to point out is that there has been a focus on
15 two measures of performance and if some other measures
16 were used, probably some other components will have
17 ended up there.

18 DR. KRESS: Yeah, I'm glad you said that.

19 CHAIRMAN APOSTOLAKIS: That's true. That's
20 very true.

21 DR. BONACA: There is no doubt in my mind
22 some of the components we probably question. For
23 example, the assumption that since it is not an early
24 release, you don't have to worry about it.

25 Therefore, you know, small failures of less

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1 than one inch penetrations could affect later releases
2 in containment and are not considered because that's
3 not significant to the public. That includes the full
4 characterization of penetrations.

5 DR. KRESS: And late releases in general.

6 DR. POWERS: It's also true that the crucial
7 systems for shut-down operations aren't going to make
8 this list here unless crucial equals well under normal
9 operations.

10 DR. BONACA: You mean for intermediate
11 targets?

12 CHAIRMAN APOSTOLAKIS: I think --

13 DR. BONACA: I am making this comment
14 because I believe that there is an issue, at least in
15 the generic fashion, for ranking we have to derive
16 which is the issue of having a well-reflected on set
17 of acceptance criteria. I mean, our CDF and LERF are
18 the only criteria to use. I mean, we have discussed
19 that.

20 CHAIRMAN APOSTOLAKIS: The question really
21 is, I mean, it is a legitimate question in a sense
22 but, on the other hand, you might say, "Well, gee, you
23 guys have approved regulatory guide 1.174 and all this
24 licensee does is follow 1.174 and that guide says LERF
25 and CDF." Shall we raise the issue of what is risk

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1 informed regulation every single time there is a case
2 before us?

3 DR. KRESS: Yes.

4 CHAIRMAN APOSTOLAKIS: Then that throws the
5 process --

6 DR. KRESS: We've approved a lot of
7 regulations in the past that have proved to have flaws
8 in them. I view this as a flaw of 1.174. You see,
9 1.174 was meant for very specific things. I think
10 we've carried it well beyond what it was intended for
11 when we try to make it a generalized way to risk
12 inform the regulations.

13 CHAIRMAN APOSTOLAKIS: The next time the
14 issue of revised or updating 1.174 comes up, I think
15 this is a legitimate issue. Put yourself in the
16 situation of a licensee. We have these new regulatory
17 guides, they want to use them, and then the issue
18 comes back and they say, "No. Look."

19 DR. KRESS: Put yourself in the place of the
20 public and the concern of late releases and land and
21 sees that NRC is not dealing with that.

22 DR. BONACA: But they have an expert panel,
23 too. The expert panel makes judgments that remove
24 components from a list and may even add them.

25 All I've got to say is to make this

1 statement that has been made, that you're going to
2 have to consider late containment failure because by
3 the time evacuation has taken place, it defeats
4 everything we have done in this industry from day one
5 which is simply you are not going to mess around with
6 the public issues.

7 CHAIRMAN APOSTOLAKIS: And why when we look
8 at license renewal we say the regulations dictate that
9 we look at it in a deterministic way. All this stuff
10 about risk and PRA over the last 25 years is not
11 relevant, all of them.

12 Why don't we say, "Gee, if you've got that
13 much frequency above the goal, maybe you ought to do
14 something more." I would say no because the
15 regulations say this. I mean, at some point you have
16 to go by the rules.

17 DR. SHACK: In this case, George, we don't
18 have a rule yet. Option 2 is trying to figure out how
19 to do this.

20 CHAIRMAN APOSTOLAKIS: They are following
21 1.174.

22 DR. SHACK: Nothing says that has to be cast
23 in concrete.

24 CHAIRMAN APOSTOLAKIS: I'm not saying it
25 should be cast in concrete. The issue should be

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1 raised but I don't think it's fatal because then
2 nobody is going to try these things. They are going
3 to say, "Wait for 10 years and until those guys in
4 Rockville decide what's important.

5 DR. KRESS: I think all we're asking for is
6 a question and an expert panel to look at it and say
7 does this particular SSC impact light containment
8 releases or late containment failure. If the answer
9 is yes, you give it a weighting factor on the scale
10 but you put that particular component in with the list
11 that you have. I maintain it would probably only add
12 about five or six. Maybe more than that but the
13 question ought to be asked is my point.

14 DR. BONACA: And the point again, the
15 latitude that the expert panel has is very large.
16 Clearly, they --

17 DR. SHACK: They don't drop things. If the
18 PRA says it doesn't get dropped --

19 DR. BONACA: If a system is rated
20 significant but has multiple trains to support it,
21 they are calling them, for example, a lower
22 significance because they have it on their system.
23 Now, they are taking quite a latitude.

24 CHAIRMAN APOSTOLAKIS: That's the same
25 issue.

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1 DR. BONACA: No, no, it's not the same
2 issue. I'm saying that the expert panel has a
3 significant decision making they have established and
4 I support it. I can question the decision but I agree
5 that they have the capability.

6 I think they should also reverse capability.
7 I think that the issue with these guys here is one
8 that looking at the generic process we would have to
9 reflect on and understand.

10 CHAIRMAN APOSTOLAKIS: I'm having problems
11 with 1.174 myself. I think when we make comments like
12 this, we should be aware of the other guy's problems.
13 If we throw 1.174 out the window --

14 DR. KRESS: 1.174 has a statement in it that
15 in addition to the CDF and LERF you will comply with
16 all the deterministic requirement. Those
17 deterministic requirements deal with things like late
18 containment failure releases.

19 Here we have an exemption that says we don't
20 have to do light containment because it doesn't affect
21 CDF or LERF, but it is in all these other
22 deterministic requirements that you are supposed to
23 comply with.

24 CHAIRMAN APOSTOLAKIS: Well, if you put it
25 that way, I think it's a more legitimate concern in my

1 view because you're doing it in the context of an
2 approved guide.

3 DR. KRESS: I think that was the reason they
4 left that kind of statement in the 1.174 is to
5 recognize it wasn't just CDF and LERF.

6 CHAIRMAN APOSTOLAKIS: In that context,
7 though, I mean, when you talk about these kinds of
8 things, the question is whether you should limit
9 yourself to these big items like core damage and
10 releases from containment.

11 A lot of these other requirements are there
12 to really address the cornerstones of the oversight
13 process. I mean, we don't want to see initiating
14 events. We don't want the integrity of the primary
15 look to be compromised.

16 A lot of the requirements are there to make
17 sure that these cornerstones are satisfied. Now if we
18 come in with a risk approach that says we are going to
19 look at CDF and LERF and late containment failures,
20 are we consistent?

21 I don't think we are because there may be
22 some requirements there, you know, the staff has made
23 it very clear we just don't want to see initiated even
24 though they may not progress to something very severe.

25 DR. BONACA: The issue of late containment

1 failure, I don't think they use the PRA for that.
2 They use some of PRA regarding the fact that the
3 highest risk is LERF.

4 MR. SIEBER: When you look and see how they
5 classify based on RAW and Fussel-Vesely, that is
6 really CDF and LERF without those extended effects.
7 I could do it but I don't think as I read the
8 methodology that they have done it.

9 CHAIRMAN APOSTOLAKIS: Do you think, though,
10 that if there was an issue regarding one particular
11 component that came from the PRA or from the questions
12 that it was really in risk 2, category 2, and it was
13 important to late containment failures, do you think
14 the panel would not be aware of that and perhaps move
15 it to something else?

16 DR. KRESS: From what I read in the report,
17 yes.

18 CHAIRMAN APOSTOLAKIS: Which may be a matter
19 of documentation again, the same as it was with the
20 other thing. If you put it in writing, then the staff
21 will stop asking questions about that.

22 DR. KRESS: All I have to go on is what I
23 have in writing.

24 CHAIRMAN APOSTOLAKIS: I know.

25 DR. BONACA: They ask questions. We ask

1 questions and the answer was because it's a small
2 leakage so it is minor and there will be no impact.

3 I mean, it really undermines somewhat my
4 faith in that expert panel because although you may
5 rationalize that, dealing with issues that have to do
6 with the last barrier of the tail end of a major
7 accident is something that is totally new in this
8 environment.

9 DR. KRESS: And their statement, George,
10 that large early releases prompt fatalities dominate
11 the risk to me is an unproven assumption. When I say
12 that, what they mean is if you meet that goal, you
13 will also meet the latent fatality goal but it says
14 nothing about land contamination, total injuries,
15 total deaths. I don't know whether it dominates the
16 risk because we do not have appropriate risk metrics
17 for these other things to compare it with.

18 CHAIRMAN APOSTOLAKIS: But, Tom, we proposed
19 to the commission to do that and they said no.

20 DR. KRESS: I know, but I'm a persistent son
21 of a gun.

22 CHAIRMAN APOSTOLAKIS: There has to be --

23 DR. BONACA: All that we have to do is say
24 this stays in the list because they are significant
25 and they could affect releases. The whole issue of

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1 performance measures from PRA would be moot if they
2 had made the call. They didn't. That's why I'm
3 questioning the call.

4 I'm not questioning the structure of the
5 regulation. I'm questioning the call. Maybe then on
6 a generic basis if those calls can be made, then there
7 has to be a need for more structured guidance.

8 CHAIRMAN APOSTOLAKIS: But it's pretty
9 clear, to me anyway, that when you consider affects
10 that go beyond CDF and LERF, that the expert panel
11 probably wouldn't know how that component actually
12 affected the late release or land contamination or
13 injuries, I think it's beyond what information the
14 expert panel would ever have.

15 CHAIRMAN APOSTOLAKIS: But in terms of the
16 cornerstones, though, I think the expert panel will be
17 very much informed. In other words, you know, on an
18 initiating event that's something that is within the
19 experience of people.

20 MR. SIEBER: Does the staff have a comment?

21 MR. NAKOSKI: This is John Nakoski. I'm the
22 project manager overseeing South Texas. I would just
23 like to remind the ACRS members that the staff shares
24 a concern regarding late containment failure. We have
25 an open item with South Texas on this issue. We have

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1 asked them to evaluate their categorization process
2 and consider methods to address that.

3 One of the alternatives we suggested they do
4 was to look at their PRA specifically for conditional
5 containment failure probability with doing a
6 sensitivity study where they increase the failure
7 rates of those components important to protecting the
8 containment by a factor of 10, similar to what was
9 done for the broader sensitivity study.

10 For each component really, or system, come
11 up with an evaluation that says why it's not necessary
12 to protect a containment. We share the concern that's
13 being expressed here and we are working with the
14 licensee.

15 CHAIRMAN APOSTOLAKIS: Why only the
16 containment? Why not the other cornerstones? I
17 thought the whole idea of special treatment was to
18 make sure that this totality of the deterministic
19 regulations protect us from public unhappiness. It's
20 not just health and safety. It depends upon how you
21 interpret health.

22 DR. KRESS: What this process will do,
23 George, is -- what this process will do is focus on
24 only risk dominant sequences when they do what they
25 talked about.

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1 If you look at conditional containment
2 failure probability, I think that's probably an
3 appropriate way to deal with this late containment
4 issue because you dealt with the other phase on your
5 CDF.

6 CHAIRMAN APOSTOLAKIS: I'm not clear. CDF
7 is in full sequence. I mean, now the initiating event
8 itself is something we don't want.

9 DR. KRESS: Yeah, but it gets involved in
10 the CDF and they've dealt with it to some extent.

11 CHAIRMAN APOSTOLAKIS: In some sense but it
12 doesn't get the same importance.

13 DR. KRESS: Perhaps. Perhaps.

14 CHAIRMAN APOSTOLAKIS: The objectives, it
15 seems to me, have not really been settled.

16 DR. KRESS: But, you know, if the thing is
17 not important to CDF and SSC, then it's likely not
18 real important to the initiating event frequency.

19 CHAIRMAN APOSTOLAKIS: No, because you may
20 have an initiating event that has been mitigated with
21 very high probability.

22 DR. KRESS: Of course.

23 CHAIRMAN APOSTOLAKIS: I think we are going
24 to come back to these things. Right?

25 DR. KRESS: Right.

1 DR. WALLIS: I had a question about that.
2 You have 5.7 percent in the PRAs but 8.78 percent turn
3 out to be safety risk significant. Presumably the
4 expert panel added quite a few.

5 MR. SIEBER: Right.

6 DR. WALLIS: I just wonder about the
7 overlap. Are there perhaps things that the expert
8 panel considers which are really more important than
9 are in the PRA? There's an overlap there.

10 MR. SIEBER: I think there are some things
11 in the PRA that are of low risk significance.

12 DR. WALLIS: So you might argue that --

13 MR. SIEBER: So not all 2,400 items that
14 were in the combined PRAs for those units necessarily
15 made it to the --

16 DR. WALLIS: I was just telling you
17 something about completeness of the PRA. The expert
18 panel adds things which really are more significant
19 than some of the things in the PRA. Perhaps those
20 things should have been in the PRA in the first place.

21 MR. SIEBER: When we get to the
22 classifications scheme that the expert panel used, you
23 can see how, for example, some components would have
24 ended up being risk significant as far as their scheme
25 is concerned and not necessarily been in the PRA when

1 we get to that.

2 DR. WALLIS: Maybe you could address that
3 later.

4 CHAIRMAN APOSTOLAKIS: The panel used
5 criteria out of CDF and LERF. They actually did.

6 DR. KRESS: If PRAs were complete and dealt
7 with uncertainties and dealt with all the modes of
8 operation such as shutdown or low power, then you
9 would expect PRA to kick out all the important things.

10 CHAIRMAN APOSTOLAKIS: That's right. On the
11 other hand --

12 DR. KRESS: It's not complete and there are
13 parts that are highly uncertain, then it doesn't deal
14 internally with shutdown and other things it doesn't
15 deal with very well so, you know, you would expect
16 other questions to be asked.

17 CHAIRMAN APOSTOLAKIS: It's not just
18 incompleteness. It's also --

19 MR. SIEBER: You could not write a PRA that
20 covered all of these components in my opinion. I
21 mean, that would be lifetimes worth of work to try to
22 model all of these subcomponents.

23 DR. POWERS: I'd like to point out that a
24 lot of people are making PRA their lifetime's work.

25 MR. SIEBER: I understand that.

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1 The reason for me putting this slide up is
2 just to show that there's two different methods of
3 arriving at determination of risk significance. As
4 Dr. Shack pointed out, these are additive. You go
5 through the PRA portion of it to cover the 2,400
6 components. Then the expert panel does the remainder.

7 Interestingly enough, they also use the
8 expert panel as a way to check by doing some of the
9 PRA components also. It turns out that there was some
10 consistency there between when they were evaluated
11 both ways. One way by PRA and the other way by the
12 expert panel. I would like to talk about the PRA
13 components first and then the expert panel components
14 next.

15 From the PRA results, classification for the
16 ranking that they got was high, medium-R, which means
17 that they want to consider it as high so that sometime
18 in the future if it became reclassified as high, they
19 wouldn't be stuck without documentation, without
20 adequate maintenance, without inspections and
21 surveillance, and all the other things that Appendix
22 B requires because these things can shift as the plant
23 is modified. There is additional operating experience
24 as far as failure rates and so forth are concerned.

25 Then medium and then lastly low. These are

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1 all based on risk achievement worth and Fussel-Vesely
2 criteria. That is one of the reasons why the PRA
3 subcommittee was a part of this to assist to the plant
4 operations subcommittee.

5 It's not clear in my mind. These look a
6 little arbitrary to me. It's not clear in my mind if
7 these are the right numbers and the right criteria or
8 not. Perhaps I could ask for comments on that from
9 anyone who feels --

10 DR. KRESS: Associated with that question is
11 if the RAW is 99 --

12 MR. SIEBER: Right. What do you do?

13 DR. KRESS: -- take it down to the medium
14 where the other things are met.

15 MR. SIEBER: That's where the expert panel
16 comes in again. We shouldn't take these as rigid
17 boundaries and so on. I mean, the expert panel does
18 evaluate the results of this, too.

19 I think the whole approach here should be to
20 put things in context. There is a decision that is
21 made by the panel. In order to make that decision,
22 they collect information from analysis. One is the
23 PRA with these kinds of things, the high, medium, and
24 so on.

25 They collect information from the five

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1 questions that Jack will talk about in a little bit,
2 the rates and so on, doing it different ways. They
3 can decide looking at the individual categories and
4 then they deliberate. This is really a structured
5 deliberation. In that context if RAW is 99 is
6 irrelevant because they will look at it and they will
7 not say, no, it's not high because it's 99 and the
8 boundary was 100. The other thing is --

9 CHAIRMAN APOSTOLAKIS: What would they do
10 with 90?

11 MR. SIEBER: Well, they have to make a
12 judgment.

13 DR. SHACK: Once you've made the decision,
14 you do have to check with the sensitivity study. I
15 claim that's the real decision.

16 CHAIRMAN APOSTOLAKIS: Exactly.

17 DR. SHACK: This is the way to select a
18 group of components to examine that way. If you can't
19 meet the sensitivity study, then you have to go back
20 and you'll throw out components that hit 90. You'll
21 have to go back and keep throwing stuff out until you
22 can get through the sensitivity analysis.

23 DR. KRESS: RAW is the sensitivity study.

24 CHAIRMAN APOSTOLAKIS: Yeah, but the big one
25 at the end where they increase the federal rates by

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1 10.

2 MR. SIEBER: I have some questions about
3 that, too, which maybe I would like to address. First
4 of all, this classification puts things on the list.
5 On the other hand, when the expert panel did evaluate
6 components, they evaluated not only the ones that
7 didn't show up in the PRA but also ones that did.

8 It could end up on this new Q-list more than
9 one way. It could end up there because of the PRA and
10 this classification scheme, or it could have ended up
11 there because of the expert panel which is independent
12 but serves as a check, one against the other.

13 CHAIRMAN APOSTOLAKIS: No, but this was
14 input to the panel. There was no categorization
15 independently of the panel.

16 MR. SIEBER: That's right.

17 CHAIRMAN APOSTOLAKIS: The panel has the
18 final word so this goes to the panel for evaluation.

19 MR. SIEBER: Right.

20 CHAIRMAN APOSTOLAKIS: Jack asked where the
21 numbers come from. It's really experience and
22 sensitivity.

23 DR. KRESS: Let me ask you a question. I
24 would expect that the value of, say, RAW or Fussel-
25 Vesely that's important would depend on absolute value

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1 in the CDF and LERF. It doesn't show what they want.
2 Why doesn't it?

3 CHAIRMAN APOSTOLAKIS: It's relative.
4 That's one of the problems with these things, that
5 whether you are at the 10 to the -3 CDF.

6 DR. KRESS: I understand that. I'm saying
7 that the cutoff, the threshold ought to depend on the
8 absolute value and I don't see that reflected.

9 CHAIRMAN APOSTOLAKIS: It was in the paper
10 by Geoak, Perry, and Sherry that these numbers and the
11 actual delta CDF don't relate. Why should you have
12 the same cutoff value for all plants?

13 DR. KRESS: If I had a CDF 10 to the -6, why
14 would I worry about the RAW and the 100.

15 CHAIRMAN APOSTOLAKIS: Because it can still
16 make it 10 to -4 which is still acceptable.

17 DR. KRESS: That's why I think I worry.
18 These might be plant specific values and I worry about
19 getting them locked into a system for every plant that
20 we review. I might not like those numbers for some
21 plants but I might like them very well for, say, South
22 Texas.

23 CHAIRMAN APOSTOLAKIS: I still think we have
24 to have things in perspective here. I don't think
25 that any single method they use can withstand the kind

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1 of scrutiny we are giving it here. We expressed a lot
2 of concerns last time at the subcommittee meeting.

3 Let's see what we're trying to do here.
4 Again, this is structured deliberation. The panel
5 puts them in categories. Then you have two major
6 things that I think save the day. One is the
7 sensitivity.

8 They say, "Okay. Forget about all these
9 things. We made mistakes. Let's raise all the
10 failure rates by 10 and see what happens." Then they
11 find that nothing much happens. That's a very
12 powerful argument.

13 DR. POWERS: I wonder how powerful it is,
14 though. The challenge you always have with these
15 things is they are one at a time kind of variation and
16 they are not really partial derivatives.

17 You tell me that you've raised all these
18 numbers by a factor of 10 it's a little difficult for
19 me to put that into perspective. Has anyone ever
20 taken one of these assessments for any plant, I don't
21 care which one, and looked at partial derivatives and
22 second partial derivatives?

23 CHAIRMAN APOSTOLAKIS: No. This is a very
24 new idea.

25 DR. POWERS: Why not? Why shouldn't

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1 somebody do that?

2 CHAIRMAN APOSTOLAKIS: Because they haven't
3 thought about it. Nobody's thought about it.

4 DR. POWERS: You see, it all boils down to
5 the question of where did the factor of 10 -- I mean,
6 factor of 10 sounds big but it's not really big. I
7 mean, we're working in long space here.

8 CHAIRMAN APOSTOLAKIS: That's my point. The
9 sensitivity study is one. The second, let's not
10 forget what the decision is here. It seems to me you
11 are relaxing some of the special treatment
12 requirements. What's going to happen?

13 If you have an impact at all, it's going to
14 be gradual. You're not going to have a catastrophic
15 failure tomorrow to 15 components and they will have
16 a monitoring problem.

17 DR. KRESS: In reality what you're saying is
18 special treatment requirements are not very risk
19 significant in the first place.

20 CHAIRMAN APOSTOLAKIS: That's exactly right.

21 DR. KRESS: That's a saving grace made for
22 here.

23 CHAIRMAN APOSTOLAKIS: Exactly. That's my
24 point.

25 DR. KRESS: But that's an assumption,

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1 George.

2 DR. SHACK: No. If you pick a different set
3 of components and change the failure rate, you get a
4 very different answer. This factor can only work
5 because you're doing it to a selected set of
6 components.

7 CHAIRMAN APOSTOLAKIS: That's correct. But
8 there are several issues here. First of all, to save
9 that relaxing the requirements will lead to an
10 increase in factor of 10 is ridiculous. It's utterly
11 ridiculous.

12 Second, you are increasing the failure rate,
13 not the event itself. It's not going to happen
14 tomorrow. You're not going to have a huge common
15 cause failure where all sorts of things fail. I mean,
16 if these things happen, they will catch them. They
17 will have a monitoring program.

18 DR. SHACK: But, George --

19 MR. SIEBER: This is one of the elements of
20 this classification scheme, the feedback system, which
21 comes from the corrective action program. On the
22 other hand, I guess when I thought about this, I think
23 of different kinds of plants with different risk
24 profiles and how this sensitivity study would reflect
25 itself in those plants.

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1 For example, the South Texas project has a
2 pretty good risk profile and it comes about because of
3 the three safety trains. When you increase a
4 competence failure rate by a factor of 10, is it
5 really going to show up as being significant in the
6 profile for that plant?

7 I would think it would not be as significant
8 because of the redundancy that is already built into
9 that plant with the three trains. But if you had two
10 trains, it may be more significant. For a different
11 plant, you may reach a different conclusion.

12 The other kind of plant that I consider is
13 there are some plants that have relatively high but
14 acceptable risk profiles and are dominated by a
15 particular sequence.

16 If you change the failure rate of a
17 component not involved in that sequence, it gets
18 swamped out by the dominate sequence so you may not be
19 able to draw a conclusion from that either. I think
20 sensitivity works better for some plants than for
21 other plants.

22 DR. KRESS: I'll tell you what bothers me
23 about the whole process is I have this intuitive
24 feeling, like George said, that this is not very risk
25 significant, but my intuition has been wrong a lot.

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1 I don't see a coherence to this process where you
2 start from the top level.

3 Our objective is to meet these regulatory
4 limits on certain things. They are going to be things
5 like containment failure, total deaths, maybe CDF.
6 I'm not even sure I would include that. Most people
7 would but we want to achieve certain frequencies which
8 you exceed land contamination. Those are all
9 regulatory objectives. Those are what we're trying to
10 achieve by the systems and components we have in the
11 design.

12 I don't see starting from those things we're
13 trying to achieve looking at how the plant already
14 meets those, and determining how each system and
15 component affects that and whether or not if I put one
16 in one category or another, whether or not I step over
17 the balance or get too close to the balance depending
18 on the uncertainty.

19 That coherence is just not there for me and
20 that's what bothers me. It just doesn't hold together
21 because, you know, you look at this and I don't know
22 why RAW of 100 is a good number for this plant. Why
23 is it a good number?

24 DR. SHACK: This is just a preliminary
25 screening value. There is a misplaced precision here.

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1 We're talking about numbers that just don't have that
2 kind of exactitude.

3 DR. WALLIS: I think they should have some
4 justification.

5 DR. SHACK: What you really look at is you
6 get to these numbers and do you get a change in CDF
7 and LERF that is significant by the standards of
8 1.174. It may well be that for other plants when you
9 go through that final assessment you'll have to use
10 different numbers. Maybe you could have changed these
11 numbers and still met that assessment in South Texas.

12 DR. KRESS: That's the part that's missing.

13 DR. SHACK: No. That's the consistency
14 part.

15 DR. KRESS: It doesn't say how these numbers
16 were derived from the 1.174 requirements.

17 DR. SHACK: The question is is it good
18 enough that when you use these numbers, you meet the
19 1.174 requirements?

20 DR. KRESS: I don't know. That's the part
21 that's missing.

22 DR. SHACK: No. They do. That's what they
23 check at the end. They mask their categorization.
24 Then they do their sensitivity analysis to make sure
25 they meet the 1.174 requirements. Could they have set

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1 the numbers at 110 and still met it? Maybe. Could
2 they set them at 90 and still met it?

3 DR. WALLIS: Maybe for some plants it should
4 be 1,000 or 10 or something. Maybe it's really
5 different for some plants.

6 DR. SHACK: The answer is as Jack said,
7 you'll get different answers for different plants.
8 Maybe if you use these numbers and you go to a plant
9 with two trains, when you make the sensitivity
10 analysis you'll find out that you don't meet the 1.174
11 requirements. You'll have to come back and change
12 these values. You'll have to be more restrictive.

13 MR. SIEBER: In fact, I see this as an
14 interactive process. If you applied this methodology
15 from one plant to another, you would have to go to the
16 end, do the sensitivity analysis to determine whether
17 you picked the right numbers in the first place.

18 As Dr. Apostolakis said, it's basically
19 experience. I don't have enough experience to say
20 whether 100 or 110 or 90 is the right number for the
21 upper boundary. On the other hand, the proof of the
22 pudding comes from the sensitivity analysis as long as
23 you understand what that really means because
24 different plants are going to respond in different
25 ways to the outcomes of that analysis in my opinion.

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1 DR. KRESS: So we're being asked to believe
2 that a sensitivity of 10 varying one component at a
3 time --

4 DR. SHACK: No, no. All together.

5 DR. KRESS: All together.

6 DR. SHACK: All together. They raise them
7 all by a factor of 10 all at once. It's not one at a
8 time. Bang, all the non-risk significant components
9 go up by a factor of 10 all together. To do what you
10 want to do, you would really have to know how the
11 special treatment affects the failure.

12 DR. KRESS: Which I agree is impossible.

13 DR. SHACK: If we want to stay here until
14 hell freezes over, we can do it.

15 MR. SIEBER: There is a more subtle question
16 buried in that. If you maintain surveillance and have
17 a good corrective action program and so forth, it
18 probably doesn't change the failure rate very much.

19 When I think about it where you don't have
20 diversity, you may change the common cause failure
21 rate which I think is perhaps more significant than a
22 single failure or an increased probability of single
23 failure. That's my intuitive feeling as opposed to
24 any proof that that would occur.

25 It seems to me if you eliminate certain

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1 portions of a consideration for a group of identical
2 components, if they're going to fail, they're all
3 going to fail in that mode sooner or later. So that
4 may have a barring on it. On the other hand, their
5 treatment of common cause appears to be conservative
6 in the way they have approached it.

7 In any event, this is the --

8 MR. SIEBER: There's a typo in there
9 somewhere. It cannot be .001 on the top because the
10 Fussel-Vesely of .002 and a RAW of 1 would be both
11 high and low at the same time.

12 DR. WALLIS: There probably is and I'll look
13 that up and tell you what it is.

14 MR. NAKOSKI: This is John Nakoski again.
15 It is on the high value Fussel-Vesely greater than
16 equal to 0.01.

17 DR. WALLIS: There are too many zeros.

18 MR. SIEBER: Okay.

19 Well, this takes care of the 5.7 percent.
20 Let's take a quick look at what the expert panel does
21 with the 94.3 percent. They ask five critical
22 questions and they rank each component by the
23 component's sensitivity to frequency of occurrence,
24 which is demand, and/or the perceived risk impact.
25 Let's take a look at the five questions.

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1 These are evaluated basically two different
2 ways. These are the questions that they chose to ask.
3 I guess one of the observations one could make is that
4 there is some overlap from one question to another.
5 It's not totally clear as to how great the answer is.
6 On the other hand, these seem to be reasonable
7 questions in my own mind to ask for the purpose of
8 categorization.

9 Does the loss of this function cause an
10 initiating event?

11 Does the loss of this function directly fail
12 another risk significant system?

13 Is the function used to mitigate accidents
14 or transients?

15 Is this function directly called out in EOPs
16 and ERPs?

17 Does this function directly affect safe
18 shutdown or mode changes?

19 Now, they have assigned a specific weight to
20 each of these questions. If you want to make notes,
21 "Does the loss of this function cause an initiating
22 event?" is weighted as three which seems to me a
23 little odd but that's the way they weight it.

24 "Does the loss of this function directly
25 fail another risk significant system?" is weighted as

1 four.

2 "Is the function used to mitigate accidents
3 or transients?" is weighted as five or most important.

4 "Is this function directly called out in
5 EOPs and ERPs?" is also weighted as five. At least
6 for the confidence of the operator, it would be nice
7 if he knew that everything that was in the EOPs or the
8 ERPs was operable and would work.

9 "Does this function directly affect safe
10 shutdown or mode changes?" is rated as a three.

11 Now, for each of the questions the component
12 is rated basically two ways. One is what is the
13 demand and what is the risk significance in the
14 component.

15 Then it is weighted by a scale of one
16 through five with five being the most risk
17 significant. You multiply the five times five points
18 for the question itself times by the weighting factor
19 which is five and you end up with a maximum 25 or a
20 minimum of five.

21 DR. WALLIS: So if they weighted them one,
22 two, three it would have been just the same.

23 MR. SIEBER: Well, they --

24 DR. WALLIS: They all got three for writing
25 their name on the paper.

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1 MR. SIEBER: That's right.

2 DR. UHRIG: Jack, this isn't as a yes, no,
3 zero, one which is then multiplied by three and then
4 multiplied by five?

5 MR. SIEBER: No. Actually, the --

6 DR. UHRIG: The question is is it or is it
7 not.

8 MR. SIEBER: The expert panel is actually
9 instructed by their procedure to rank. Okay? And
10 that's on the basis of frequency of occurrence or
11 demands and risk significance. Is that not correct?
12 It's not a zero one proposition.

13 For example, and let's go back, if I asked
14 the question, "Is the function used to mitigate
15 accidents or transients." When the demand is high and
16 the risk significance is high, I would rank it as
17 five. Five times the weighting factor of five is 25
18 so you get 25 points. Okay?

19 On the other hand, does the function
20 directly affect safe shutdown or mode changes, the
21 weighting factor is three. Even though it may be
22 important and risk significant, the total score of
23 five times three is 15. Okay?

24 DR. WALLIS: Who fills this out? Does the
25 STP fill this out or does the expert panel fill this

1 out?

2 MR. SIEBER: The expert panel who is
3 employed by STP.

4 DR. WALLIS: They have to answer all their
5 own questions?

6 MR. SIEBER: That's right. You end up, by
7 the way, as part of the process a different feudalism
8 than the original one which is part of the submittal.

9 DR. WALLIS: So they have to do all the work
10 of finding out if this function is called out in EOPs
11 and all that?

12 MR. SIEBER: That's right. It's pretty easy
13 to do. The EOPs are on the computer and all the mark
14 numbers are in there. All they have to do is a word
15 search and out comes all this --

16 DR. WALLIS: Yeah, but if it's a kind of
17 secretarial job, we really don't need to have an
18 expert panel do it.

19 MR. SIEBER: No. The clerical function of
20 arranging all this I'm sure is done by clerks. The
21 panel actually has a pretty demanding qualification
22 requirement as I see it.

23 MR. LEITCH: Jack, are there two answers,
24 one based on frequency and the other based on
25 perceived risk impact or are they somehow merged

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1 together?

2 MR. SIEBER: They are merged together so
3 that you end up with a single number. These are the
4 risk impact and the frequency and this is the way it's
5 phrased. If you look in your package, there would
6 have been -- you weren't there but there is a document
7 called "ACRS Backup."

8 If you look at that, and these pages aren't
9 numbered, but about halfway through where it says
10 "weighting scale," it explains how the questions are
11 asked, how the match is done, and how the scores are
12 determined. They are actually determined two
13 different ways. One of them is you determine the
14 total score based on all the questions.

15 As it turns out, the combination of two
16 fives, a four, and two threes when multiplied by five
17 equals 100. That's where the weighting factors
18 actually came from as opposed to getting 25 points for
19 putting your name on the paper.

20 So then they look at the ranges in which
21 these answers came out and they said if it's between
22 71 and 100 it's high-risk significance. If it's
23 between 41 and 70 it's medium-risk significance. If
24 it's 21 to 40, it is low-risk significance. Zero to
25 20, it is not risk significant at all.

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1 This is one of two methods that they use to
2 categorize. The other method actually looks at the
3 answers to individual questions. If you get an answer
4 for an individual question with this weighting factor
5 that is greater than 20, then any one question
6 automatically high-risk significance.

7 If it's between 12 and 20 it's medium-risk
8 significance. If it's between six and 12 for any
9 single question, it's low-risk significance. If it's
10 below six, it's not risk significant at all.

11 These are additives. You can either achieve
12 the score this way or the answer to a single question
13 could put it into a category, the components up in the
14 highest category of whatever method is used.

15 Now, I have to ask myself a few questions
16 when I think about this whole process. The question
17 that come to my mind is when we just stick with CDF
18 and LERF, which to me is implied when you use RAW and
19 Fussel-Vesely, are these -- that's not true?

20 DR. KRESS: No. You can do a RAW or Fussel-
21 Vesely on anything.

22 MR. SIEBER: Okay.

23 DR. KRESS: But the RAW and Fussel-Vesely
24 they use were for --

25 MR. SIEBER: For CDF and LERF. Well, the

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1 question is are these the right criteria and are they
2 the only criteria that should be used which, in fact,
3 CDF and LERF --

4 DR. WALLIS: Let's go back to what's
5 happening here. There's the PRA results which form
6 one package. Then there's the 94 or 96 percent.

7 MR. SIEBER: Right. Another box.

8 DR. WALLIS: This is the other box.

9 MR. SIEBER: And they overlap.

10 DR. WALLIS: The experts don't evaluate the
11 stuff that's in the PRA using their matrix?

12 MR. SIEBER: Yes, they did.

13 DR. WALLIS: Ah, so you can compare one
14 versus the other.

15 MR. SIEBER: In fact, that's one of the
16 checks used during the process.

17 DR. WALLIS: Okay.

18 MR. SIEBER: That's one of the checks.

19 DR. SHACK: That's how you decided that the
20 binning was reasonable.

21 DR. WALLIS: Is there some evaluation of the
22 reasonableness of the binning when you look at this
23 comparison?

24 MR. SIEBER: Yes.

25 DR. WALLIS: Okay.

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1 MR. SIEBER: And to me that's one of the key
2 saving graces of this process, at least from the
3 standpoint of what the staff has to deduce out of the
4 process to say, "Yeah, this is reasonable." Or, "No,
5 it is not." That is one of them. The sensitivity
6 studies is another one. To me I think it's pretty
7 important that they did that overlap and came up with
8 a reasonably consistent answer because that tells you
9 something about the effectiveness of the panel.

10 DR. SHACK: I seem to recall numbers like
11 PRA gave me 800 and the expert panel on the same set
12 of components gave me 840 so they were somewhat more
13 conservative which you would sort of expect.

14 MR. SIEBER: Okay. The next question that
15 I asked in my own mind, which we have discussed at
16 length here, is are RAW and Fussel-Vesely the correct
17 measures of importance of the component in this
18 context and also the numbers.

19 DR. WALLIS: You shouldn't use the term
20 correct. You say appropriate or something.

21 MR. SIEBER: Appropriate.

22 DR. WALLIS: Correct implies some sort of
23 absolute standard which is the reason for these
24 things.

25 MR. SIEBER: That's right. Okay. And the

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1 third question, I think, that I asked of myself, which
2 I came away with based on the outcome of the
3 comparisons as being okay, is do these deterministic
4 questions and the weighting factors make sense.

5 I guess you can ask any questions that are
6 pertinent to risk and assign any weighting factors.
7 The proof of the pudding is when you compare that to
8 the PRA studies, do you end up with consistency? The
9 answer is yes. These are reasonable questions to ask
10 except, in my opinion, there is some overlap
11 associated with them.

12 I scratch my head. For example, does a
13 failure of this component create an initiating event,
14 and they weighted it only as three. I thought, gee,
15 if you don't have any initiating events, your risk
16 goes way down. It wasn't clear to me why that was the
17 case.

18 On the other hand, there's a lot of
19 initiating events that don't proceed beyond the fact
20 that the plant shuts down safely and 9,999 out of
21 10,000 is probably the right number for that because
22 we've only had in commercial plants one accident.

23 DR. BONACA: You are close to the end,
24 right?

25 MR. SIEBER: Yes, I am. We'll move rapidly

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1 to the end. I just have two more slides to do.

2 The process of doing this comes up with a
3 two-by-two matrix which looks at safety related and
4 risk significant components, non-safety related but
5 risk significant which covers the two categories that
6 I listed first as the purpose, and then safety related
7 non-risk significant and non-safety related non-risk
8 significant.

9 Of course, they end up with 8.7 percent as
10 compared to 5.7 which is one way or another identified
11 by the PRA as being important. There is some overlap
12 so the expert panel actually added approximately 1,200
13 components to the process. Non-safety related and
14 risk significant, 372.

15 Now, the question here is these were not on
16 the original Q-list but it turns out that they are
17 important from a safety and risk standpoint. So the
18 question is do we now have a safety question that
19 perhaps STP has answered by using this process.

20 But maybe there are other plants out there
21 that have similar original classifications schemes
22 where they haven't gone through this process and
23 perhaps there are components in other plants that have
24 more risk significance than is reflected in the
25 application of Appendix B. To me, that's a site

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1 benefit to STP but a question for the staff to think
2 about in the process.

3 Safety related and non-risk significant is
4 12,905 which would be the items where special
5 treatment requirements could be relaxed to one extent
6 or the other. And non-risk significant and non-safety
7 significant is all the remainder of the components in
8 the 29 safety systems that were analyzed.

9 DR. POWERS: Jack, I never understood
10 exactly why in the safety related non-risk significant
11 category we don't just treat them the same as the non-
12 safety related, non-risk significant. I relax it down
13 to industrial use or whatever it is that you specify
14 for --

15 MR. SIEBER: I think that when you go back
16 to the slide, and I may not be able to remember it,
17 but there was four classifications from high, medium
18 or --

19 DR. POWERS: I understand that.

20 MR. SIEBER: So in some cases components,
21 the application of special treatments, was not fully
22 relaxed so that in the event that --

23 DR. POWERS: I know what they've done. What
24 I don't understand is why they've done it.

25 MR. SIEBER: Why they did it the way they

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1 did? I think it is a conservative approach in my
2 opinion.

3 MR. NAKOSKI: This is John Nakoski if I
4 could address Dr. Powers' question. In option 2 one
5 of the restrictions that we have is that we need to
6 maintain a design basis of the plant, which is what
7 the plant was licensed to.

8 Completely relaxing all the controls without
9 having any confidence that these components would be
10 able to perform their functions would essentially be
11 a change in the design basis which would be a change
12 in the licensing basis which is not where we wanted to
13 be in option 2. That's the short answer, sir.

14 DR. POWERS: See, I come from the viewpoint
15 for these non-safety related non-risk significant
16 items when they acquire them, they basically acquire
17 things that actually work and do their job so your
18 confidence here, if you did the same thing for these
19 things in the lower left-hand corner, it's not that
20 you would have zero confidence. You would not have
21 maybe as much as you would for the upper left-hand
22 corner but it's not zero.

23 I think there's a nice term or phrase for
24 industry practice or something like that for the kind
25 of confidence you have. It just strikes me as

1 timidity for the reason of being timid. That's what
2 it strikes me as.

3 MR. SIEBER: I think the kinds of things
4 that are relaxed are some of the pedigree
5 requirements. Is that not the case?

6 DR. POWERS: Sure.

7 MR. SIEBER: You buy a valve and the valve
8 cost you \$1,000, but the bill you get is \$10,000 and
9 the paper that you get weights three times as much as
10 the valve.

11 DR. POWERS: It should because --

12 MR. SIEBER: You have to ask yourself how is
13 that used for safety?

14 DR. POWERS: It's nine times more expensive.
15 I mean, the paper is nine times as expensive as the
16 valve so it should weigh more.

17 MR. SIEBER: That's right.

18 DR. POWERS: It's a trouble I have with
19 option 2 to begin with.

20 MR. SIEBER: I think what you're telling us
21 is it's as much a legal requirement as anything else.

22 MR. NAKOSKI: Specifically for South Texas
23 and the exemption space, yes. In rule making there
24 may be other alternatives.

25 MR. SIEBER: Now, just to finish up here, on

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1 February 8 we got a package which listed basically
2 open items. I think there were 18 open items -- or
3 22. In any event, when we actually had the
4 subcommittee meeting, we only talked about three open
5 items.

6 The difference is because at the
7 subcommittee meeting we are only talking about the
8 categorization process. The list that we had on
9 February 8 included all open items on the option 2
10 process. A lot of those have gone away.

11 Let's see. Actually, on that list there
12 were 16, four of which were closed, one of which was
13 confirmatory, one which is before the risk informed
14 licensing panel for some kind of a confirmation or
15 final resolution or approval, and seven still remain
16 open for the whole process. Is that correct?

17 MR. NAKOSKI: I can give you some more
18 updated information. We met with South Texas on
19 February 15 and 16. There were currently five open
20 items that were closed without exception based on the
21 licensee's response.

22 Three open items that with some editorial
23 changes that were agreed to during the meeting would
24 be closed. Six have some level of success path
25 identified and agreed to into varying levels of detail

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1 and agreement.

2 Three require, I think, further interactions
3 between the licensee and the staff and those deal
4 primarily with the seismic and environmental
5 qualification issues. There is one on controlling
6 changes to the processes that the staff has not yet
7 finalized its position on.

8 MR. SIEBER: Okay. Thank you.

9 That concludes the presentation if anybody
10 has any comments. This is where we stand at this
11 point. I was sort of under the impression that what
12 we ought to do is wait until the process is completed
13 before we write a letter but we may want to reconsider
14 that because, I guess, in my opinion this is a pretty
15 complex subject and to leave everything until the end
16 might cause a setback from the staff's standpoint on
17 their timely resolution of things. That's something
18 we have to decide this week.

19 DR. BONACA: What are the thoughts of the
20 staff regarding the report at this time?

21 MR. NAKOSKI: I think your insights on
22 categorization at this time would be valuable for us
23 to move forward recognizing that you haven't gotten
24 any substantial feedback on where we are with
25 treatment. I think there would be value added now to

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1 get this behind us.

2 MR. LEITCH: I have one question regarding
3 weighting. If I understand correctly, zero to 20 they
4 call non-risk significant.

5 MR. SIEBER: That's right.

6 MR. LEITCH: That would then put it in the
7 lower left-hand box, safety related.

8 MR. SIEBER: If it was on the Q-list and it
9 was zero to 20 and confirmed by the expert panel as
10 belonging there, it would be in the lower left-hand
11 corner.

12 MR. LEITCH: I can understand how it would
13 get to the very low risk-significant but not non-risk
14 significant. In other words, if you ask these
15 questions, say is the function used to mitigate
16 accidents or transients, and even if it's a three as
17 far as risk, I tend to get a 15.

18 MR. SIEBER: I think what happens is a lot
19 of times in the original classification of what
20 belongs on the Q-list and what does not, they would
21 take it either as functions or systems.

22 There are things in a system that might
23 require some pedigree because it originally fell under
24 the requirements of Appendix B who really doesn't
25 serve any function whatsoever as far as accident

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1 mitigation.

2 It's not called out in the EOPs. It can't
3 cause an initiating event. It's just there. It's in
4 that system because of the way it was classified the
5 first time around. I suspect there are a fair number
6 of items that are like that.

7 MR. NAKOSKI: Mr. Leitch, if I could answer
8 that. An example at South Texas, for example, a gauge
9 in a safety related system that's just used to collect
10 data. It doesn't perform any function. Answer does
11 it initiate an event, you're going to say no so it's
12 zero. There's a lot of times when you answer those
13 five questions you can have a zero.

14 DR. UHRIG: Then you do have a zero one type
15 thing multiplying.

16 MR. NAKOSKI: It's a zero if it's no and it
17 can be one through five if it's yes based on --

18 DR. UHRIG: Okay.

19 MR. SIEBER: Mr. Chairman.

20 DR. BONACA: With that, any other questions?
21 I think we will have to make a decision later. I
22 think we should have also the chairman here to make a
23 decision on whether we should write a report. We
24 heard the request and that may be appropriate at this
25 time.

1 If there are no further questions, at this
2 point we'll take a break for 15 minutes and resume
3 again at 20 of 11:00.

4 (Whereupon, at 10:26 a.m. off the record
5 until 10:40 a.m.).

6 DR. BONACA: Let's resume the meeting now.
7 I wanted to start on time because we have Mr. Grimes
8 here who came to help us and Mr. Prato who is the
9 present manager for the Arkansas One License Renewal
10 Application.

11 The intent here for me was to provide you
12 with a summary of the meeting that took place last
13 week on this subject. We decided not to have a full
14 presentation to the committee because, you see, this
15 application is very similar to the Oconee applications
16 and we felt there were no issues that deserve at this
17 time to have a full presentation from the applicant
18 and the staff or the full committee.

19 The intent right now is not to write an
20 interim letter at this time and distribute to you a
21 two-page summary that I put together for my own use to
22 keep a memory for the final report we'll have to write
23 when the open issues are closed.

24 This summary that you have in front of you
25 does not contain information on the open items. I

1 will provide it to you as I walk through these
2 paragraphs.

3 Also, this two-page summary. On the second
4 page at the bottom has Jack Sieber written in. For
5 some reason his name got into it but he doesn't belong
6 there so disregard it. As you can imagine, I was
7 surprised when I saw that but somehow it got there.
8 This is to do with some of the intricacies of
9 computers I guess.

10 DR. SHACK: Of all the random things to type
11 Jack Sieber seems pretty far down on the list.

12 DR. BONACA: So let me just walk through a
13 little bit this summary.

14 On February 22 we met with the
15 representatives of the applicant from Entergy for
16 Arkansas One and presented to the staff to review the
17 Arkansas One license renewal application and the
18 interim SER.

19 The SER we just call interim because the
20 open items are now closed. Arkansas One is a B&W-type
21 PWR designed to generate 2568 megawatt thermal or
22 about 836 megawatt electric.

23 Now, the reactor is very similar to the
24 Oconee units that we recently reviewed and for which
25 have approved those who participated in the approval

1 of the SER and of the application.

2 Because of the similarity Arkansas One has
3 utilized a lot of the lessons learned from the license
4 renewal of Oconee. In order to benefit from these
5 similarities, we asked the staff to provide us with a
6 presentation that would highlight the differences
7 between the applications for Oconee and for Arkansas,
8 as well as the differences in the solutions which
9 means specifically age and management programs that
10 they have chosen if there are differences.

11 The reason is this will allow us to benefit
12 from previous experience. I would rely on your
13 judgment for future applications if that's the right
14 approach. I believe it is the right approach because
15 it allows us to keep our memory of where we're going,
16 even for the BWRs we are going to review with the
17 exceptions of the reactor vessel and other components
18 which relate to that.

19 There is so much similarity in the
20 applications from PWR and BWRs simply looking at
21 passive components so the staff provides us with an
22 informative presentation which was really based on the
23 formative comparison.

24 The second observation I would like to make
25 is that the application which appeared at the

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1 beginning quite condensed was quite effective, I
2 think. I'm giving this feedback because it really was
3 easy to review it for a number of reasons. One is it
4 contained in the back a number of appendices which
5 condensed the information we needed.

6 For example, Appendix B contained a full
7 summary of all the problems that are being credited
8 for a license renewal and also segregated the first
9 seven problems and new problems. The rest were
10 existing problems. That really helps understand where
11 the new issues are, where the new problems are. That
12 was, in my judgment, a very good format.

13 Appendix C described the approach that was
14 chosen to manage aging effects. Also that was very
15 helpful because, again, you have a full dedicated
16 appendix where you can go to look for those solutions.

17 I just bring up these issues because I don't
18 know to what extent the next applications will reflect
19 this format but maybe there is some chance because of
20 the NEI.

21 MR. GRIMES: Dr. Bonaca, this is Chris
22 Grimes. I would comment that I think you'll find
23 Arkansas is very close to the standard form and
24 content that we are recommending in the standard plan
25 and the NEI guide that we would endorse with the

1 regulatory guide.

2 DR. BONACA: Thank you. With that, in
3 general the subcommittee had the following
4 observations or questions regarding scoping and
5 screening. The scoping and screening methodology
6 devised by the applicant identifies components appear
7 to be well structured and comprehensive.

8 This methodology we know is consistent
9 within the I-9510 and also with the NRC SRP. The
10 Arkansas One FSAR was facilitated in many ways because
11 the definition that Arkansas has used for safety
12 related is the same definition that the license
13 renewal rule uses for safety-related components.

14 Also, the Arkansas One Q-list include all
15 the support systems of the safety-related component or
16 those systems which are not safety-related but whose
17 failure would cause safety-related systems not to be
18 effective. Therefore, because of the definition that
19 they have used for actual list, it was easy for them
20 to pull those lists out and say these are the
21 components which are in the scope of license renewal.

22 Actually, in addition to that, the Arkansas
23 application included a number of systems and
24 components which were included in the Q-list purely
25 because they could have interference with safety-

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1 related systems by physical interaction, for example.

2 That expanded somewhat the scope and the
3 feeling you get when you look at the application is
4 that the scope in general is pretty conservative. It
5 went beyond the requirements of the rule in my
6 judgment.

7 DR. WALLIS: Can I ask you about electrical
8 cables?

9 DR. BONACA: We'll get there.

10 DR. WALLIS: This may look like Ocone but
11 the cables can be quite different. We know that there
12 is degeneration of cables. I was looking at the hatch
13 which is a different one all together. I couldn't
14 quite figure out why some of the cables got screened
15 out and some of them were considered because we know
16 the cables do deteriorate. Do they pay proper
17 attention to the cables?

18 DR. BONACA: I think for the EQ medium
19 voltage cables they are going to be subjected to the
20 requirements that result from the generic issue
21 resolution.

22 MR. GRIMES: Dr. Bonaca, I would like to
23 clarify there are three points that are raised by Dr.
24 Wallis. The first is with regard to scoping and
25 whether or not particular cables are screened out

1 based on function.

2 As I recall Arkansas uses a spaces approach
3 so they would only screen out cables if there aren't
4 any in the space. We were confident that the scoping
5 will capture all of the requisite cables whether they
6 are subject to EQ under 5049 or not. We rely on the
7 process for compliance with 5049 to maintain the
8 qualified life for EQ cables. For non-EQ cables the
9 applicant has proposed to --

10 Is this an open item?

11 MR. PRATO: An open item on medium voltage
12 cables -- this is Bob Prato -- that are inaccessible
13 and that can be exposed to underground conditions.

14 MR. GRIMES: And we would expect the same
15 form of resolution that we achieved on Calvert Cliffs
16 and Oconee.

17 DR. BONACA: I never thought about the
18 medium voltage cable because it's an open item.

19 Regarding scoping and screening again, I
20 said before that it seemed to me it was quite
21 comprehensive and went somewhat beyond the narrow
22 interpretation of the rule.

23 There are two open items on that. They have
24 to do with the flow orifice that brings in the sodium
25 hydrazide and the question is why is it not included

1 in the scope. The other issue is why are a number of
2 fire protection systems and components not in the
3 scope.

4 My sense is those are good questions. I
5 understand the reason for the resistance on the part
6 of the applicant about his issues. It's simply that
7 they need to provide more information to bring closure
8 to these issues. We felt that we agreed with these
9 questions and they need to be addressed.

10 These are the only open issues on scoping.

11 Now, the subcommittee also raised a number
12 of specific questions on scope. We made an effort of
13 raising questions regarding systems that have the
14 appearance of having been in the scope and they were
15 not.

16 To all those questions we raised during the
17 subcommittee we got answers from the licensee on the
18 staff that said that either there was a good reason
19 why they were not scooped and we accepted the reason,
20 or they indeed were in scope.

21 Often times the reason why there was a
22 disconnect in the understanding is that the
23 application included in scope, the SER included in
24 scope because there had been already communication
25 between the staff and the licensee and that brought

1 the component in scope.

2 Now, we asked questions regarding these
3 issue. Would the application be modified to include
4 those changes which were negotiated in the
5 federalization of the SER and the answer was no but
6 the FSAR update will include those commitments.

7 Regarding the process used by the applicant
8 for defining aging effects requiring aging management,
9 that process appears to be comprehensive and
10 effective. They used a new approach where they have
11 a set of tools in what they call Appendix C.

12 In our review we found that the application
13 has considered the aging effects we have seen in
14 previous applications. They really have applied the
15 lessons learned from previous applications. That's
16 pretty obvious.

17 There are some open issues regarding some of
18 this aging management programs. They have to do, all
19 of them in my understanding, with additional
20 information to better understand why they are
21 effective enough to deal with the aging management
22 issues. Is that correct?

23 MR. PRATO: This is Bob Prato. What they
24 need to do is they need to add additional description
25 to the FSAR supplement. There are 11 of those items

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1 where the description that they provided in their
2 application was inadequate and they needed to provide
3 more information in the supplement itself.

4 DR. BONACA: So I understand in that sense
5 there is no contention there except you want to have
6 more information and detail on what they are
7 committing to.

8 MR. PRATO: That's correct.

9 DR. BONACA: In the section that has to do
10 with limited aging analysis, there also seems to be a
11 pretty comprehensive inclusion of all the issues
12 they've seen for other plants. There are a number of
13 open issues on this.

14 One has to do with the -- well, one has to
15 do with additional information also regarding TLAA in
16 the addendum to the FSAR.

17 Second has to do with buried medium voltage
18 cables for which the staff is contending that similar
19 cable not in similar environment is not indicative of
20 the status of the one which is buried and, therefore,
21 cannot be used as an indication and they are
22 requesting a program for that and we fully agree with
23 that kind of perspective and we are going to see that
24 there is closure on this issue.

25 There is another TLAA which is still open

1 regarding the specific criteria to be used for forces
2 of the Arkansas One containment. That's also, it
3 seems to me, reasonably similar to the Oconee
4 questions that we had. I would expect to have a
5 similar closure on that.

6 There is finally an open issue of the aging
7 of boroflex. During the presentation we are told that
8 the applicant has agreed that is a problem even for
9 the current life and, therefore, they will provide a
10 solution that doesn't address specifically the
11 extended life but specifically boroflex now.

12 I guess the question I have for the staff is
13 are you looking for a commitment at this stage?

14 MR. GRIMES: Dr. Bonaca, this is Chris
15 Grimes. The controversy evolved primarily because the
16 applicant chose to challenge the definition of a time-
17 limited aging analysis to put this into the context of
18 a corrective action.

19 We don't want to argue about whether it's a
20 time-limited aging analysis. We believe it is. What
21 we're trying to focus on now is establishing
22 confidence that there are program attributes
23 associated with the corrective action that can be
24 relied on in a programmatic way.

25 We don't necessarily need to know exactly

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1 how the life-limiting aspects are going to be fixed,
2 but we want to know that there are the 10 program
3 elements in place that will ensure that before there's
4 a loss of function corrective action is taken. I
5 think we'll be able to work that out with the
6 applicant.

7 DR. BONACA: The only surprise I had
8 somewhat there is that for initial the nature I know
9 that other licensees have already developed plans to
10 deal with what is the criteria which you've cited at
11 some point you cannot operate any further so some of
12 them assume that they have certain split open spaces
13 or assume that you have large gross formation of
14 boroflex. I was somewhat surprised that Arkansas did
15 not have a problem with the nature.

16 MR. GRIMES: Actually, I think Arkansas was
17 also surprised. I think they had envisioned that this
18 was an issue that they could deal with in the future
19 and they had originally, and Bob can correct me if I'm
20 wrong, it originally said that, "This is a time-
21 limited aging analysis and we can manage it."

22 Then they were surprised to discover that
23 the inspection results did not support the current
24 licensing basis. They were trying to get positioned
25 so that when they deal with the future of their spent

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1 fuel capacity and the maintenance of that facility,
2 that they would decide how to deal with it. I imagine
3 that it was for timing more than anything else for
4 Entergy.

5 DR. BONACA: Okay. I already spoke about
6 the effectiveness of Appendix B. Having this summary
7 listing of problems has allowed us to really get a
8 sense of the extensiveness of the problems.

9 Appendix B is formatted in a way where you
10 have this seven new problems. Then you have all the
11 other problems which already exist but some of them
12 are modified to deal with some of the issues which
13 will be raised in the context of license renewal.

14 In my review of the SER, it was apparent
15 that the staff had performed an effective review of
16 the Arkansas One application. We asked questions
17 regarding the process that was used and there were two
18 processes.

19 Certainly the first one is a lesson learned
20 also for the subcommittee licensing ACRS. They
21 specifically take systems of components which are not
22 in scope and test why they have been left out. Now,
23 that's a guidance which is also given in this SRP, but
24 I think this time I use it personally and I found I
25 had a lot of questions.

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1 Each one of us has a sense of what really
2 should be a safety system. For example, the Fussel-
3 Vesely measurement device does not have any other
4 function than the safety function. The question of
5 why it's not in scope is a good question. The answer
6 is provided and so it was acceptable but I think that
7 was an effective review that the staff performed.

8 Another question we asked was regarding the
9 staff visits to the site. They were performed by the
10 staff and clearly they had done a reasonably extensive
11 process of V&V, validation and verification. I
12 believe there were two trips to the site involving
13 several days and several people.

14 MR. PRATO: This is Bob Prato. There was
15 actually three. There was an audit for the
16 methodology review. Then there was a scoping
17 inspection to verify the implementation of the
18 methodology. Then there was a two-week aging
19 management review.

20 The last two, the scoping inspection and the
21 aging management review, involved seven spectors and
22 the scoping methodology, the week that we spent on
23 site, involved three engineers from the site -- from
24 headquarters. I'm sorry.

25 DR. BONACA: The second visit was for what

1 you said?

2 MR. PRATO: For verifying that they
3 implement the scoping methodology correctly. It was
4 a scoping inspection. During that inspection we
5 actually looked at systems that were excluded and
6 verified that they had good justification for
7 excluding them. Then we looked at the structures and
8 the components individually and made sure they
9 included them correctly as well.

10 MR. GRIMES: This is Chris Grimes. Just to
11 make sure that we keep the process clear, we refer to
12 an audit of the methodology. That is the team from
13 headquarters that goes down and gathers information
14 first hand that they use to prepare their safety
15 evaluation of the methodology.

16 The other two pieces are the scoping
17 inspection and the aging management program
18 inspection. Both of those are conducted under
19 inspection manual chapter 2516.

20 Those inspection reports then support the
21 recommendation by the regional administrator. That is
22 when we go back to the path that shows all the
23 contributors to the evaluation findings. We try to
24 keep the product lines distinguished.

25 DR. BONACA: Okay. The subcommittee noted

1 that a number of new problems and one-time
2 inspections, seven in total, have decreased
3 significantly from the first application. The first
4 application had 30 odd one-time inspections and this
5 one has two.

6 We asked questions of the staff and the
7 reason clearly is that a lot of the open issues have
8 been addressed now. I would like Mr. Grimes to
9 describe the reason.

10 MR. GRIMES: Dr. Bonaca, as we've reflected
11 on our ability to explain to the ACRS the consistency
12 and the treatment of our review process, we discovered
13 as time as gone on we've learned some lessons. We are
14 going to explain those to the committee when we
15 present the generic aging lessons learned report.

16 One part of this is evidence that lessons
17 have been learned and applied. A second part is that
18 the numbering system, the accounting system has
19 changed from plant to plant. If you recall, for
20 Calvert Cliffs we counted some 436 programs. We were
21 actually counting individual procedures.

22 On Oconee we had roughly the same number
23 that Arkansas reports and that is about 30 programs.
24 Also, there is a reflection here that Arkansas was
25 much more aggressive than Calvert Cliffs or Oconee or

1 even the industry in general in their GALL approach.
2 Arkansas has leaned forward and they are taking on a
3 number of these routine inspection activities.

4 I think the best example is by going to a
5 risk-informed service inspection program they captured
6 small bore piping which is a one-time inspection in
7 GALL and it is still a controversy with the industry
8 in terms of whether or not license renewal should be
9 solving that problem or some industry initiative
10 should be credited for that problem.

11 I do think that is appropriate that we
12 should give recognition to Entergy's aggressiveness in
13 treating these areas. That accounts for part of the
14 reduction, too.

15 I have also committed that when we come to
16 explain GALL to the committee, we will provide a
17 cross-reference of what was done for Calvert Cliffs
18 and Oconee and GALL in order to show the evolution of
19 the learning.

20 DR. BONACA: I believe that's really very
21 useful to the committee if we can get this perspective
22 of how those one-time inspections have evolved. I
23 looked at some of the one-inspections which were in
24 Fussel-Vesely terminals and they are, in fact,
25 included in the program here and there was no specific

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1 identification separately of the one-time inspection.

2 It was simply folded in the problems as some
3 of the other applicants have done, too. I did it not
4 under duress but still under some kind of negotiation
5 and had to choose how to do it.

6 Clearly, Arkansas came in and I believe that
7 as the industry accepts this kind of resolutions,
8 these will facilitate the next applications and
9 reviews.

10 During the subcommittee meeting we noted a
11 number of apparent inconsistencies between the
12 application and the SER information already assembled
13 when we were talking about scoping but we found it
14 mostly in the problems.

15 Typically, again, discrepancies were tied to
16 the fact that the applicant proposed some program, for
17 example, visual inspection of some piping. The staff
18 said, "Visual is not enough. You should have
19 ultrasonic examinations."

20 The applicant agreed so the SER documents
21 ultrasonic testing as the program used to deal with a
22 particular issue while the application still quotes
23 visual so there wasn't really a discrepancy there.
24 The discrepancy had been either solved.

25 Typically the discrepancy resulted in an

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1 augmented program in the SCR than was presented in the
2 original application. I understand that the addendum
3 to the FSAR will contain all the commitments anyway so
4 there will be commitments as reflected in the SER.

5 In conclusion, the feeling we got as a
6 subcommittee was that the staff has performed an
7 effective review of the Arkansas One application. The
8 Arkansas One application is an aggressive application
9 that went, from what we can see, beyond the minimum
10 requirements of the license renewal rule.

11 Therefore, we felt confident that we
12 understood enough to stay with the process right now.
13 We recommend the committee that we do not at this time
14 write a letter.

15 We also would not conduct a subcommittee
16 meeting to review the closure of the open items
17 because there are very few. Are intent is they want
18 to bring in now the staff back the applicant for a
19 full committee meeting when the open items are closed.
20 Hear a presentation by the applicant at that time and
21 hear a presentation by the staff and we will write a
22 report at that time.

23 Any questions from members or staff?

24 DR. WALLIS: The CD that we have with the
25 application, nothing has changed from that so if I go

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1 back to that to look at things, that is the key
2 document to review before our next meeting?

3 MR. GRIMES: That's correct. The CD
4 contains the application as submitted and it also
5 provides the FSAR. Dr. Bonaca has made the point that
6 when you review the safety evaluation, the safety
7 evaluation will articulate the paper trail from the
8 application to a resolution. All the correspondence
9 that has occurred in the intervening time should be
10 clear in the safety evaluation.

11 MR. PRATO: This is Bob Prato. All that
12 correspondence is identified by dates and each of
13 those letters that were provided by the staff and the
14 applicant are on the docket. There is a complete
15 paper trail on the docket. If you need anything
16 specific, though, feel free to call us and we'll make
17 sure you get a copy of whatever you need.

18 DR. BONACA: Tomorrow, I believe, we will
19 also talk about the Hatch application. The SER is
20 coming to come for our review. Well, you probably
21 already received it at home.

22 With that also we have two subcommittee
23 meetings, one that will lead us to review the guidance
24 documents, the final changes to those. A second
25 meeting on the BWR VIP which support in some form the

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1 Hatch application.

2 We have talked about having a presentation
3 of the Hatch application and the SER in the same
4 format by emphasizing the similarities with even PWRs
5 given the fact that there are so many classes of
6 components or commodities that are similar
7 irrespective of the type of reactor that is being
8 used.

9 MR. DUDLEY: This is Noel Dudley. I do have
10 those documents in house. I can send them out either
11 express mail if you want to start working on them
12 Monday, or I can send them regular mail and you'll get
13 them Wednesday or Thursday next week.

14 DR. BONACA: These are the SERs?

15 MR. DUDLEY: These are the SERs. These are
16 four BWR VIP reports, associated SERs, and all the
17 proposed final draft of guidance documents.

18 DR. BONACA: Guidance documents. Okay.

19 MR. DUDLEY: Well, say the March 1 draft of
20 the guidance document.

21 DR. BONACA: So all the members of your
22 choice. You can take it with you.

23 MR. LEITCH: It's 1,700, 1,800 pages.

24 DR. BONACA: What we thought of doing was to
25 send to you only those sections that you are asked to

1 review.

2 MR. DUDLEY: I think the document is small
3 enough. The actual GALL report now is only a couple
4 inches.

5 DR. BONACA: It's small enough you can
6 memorize it.

7 CHAIRMAN APOSTOLAKIS: Is anyone dying to
8 have it in his hands by Tuesday or Wednesday?

9 DR. WALLIS: I would love to have a CD
10 rather than a big pile of paper. That means someone
11 has to scan it in presumably which is a pain.

12 MR. DUDLEY: Disks for the guidance
13 documents are not available yet.

14 MR. GRIMES: This is Chris Grimes. We had
15 envisioned putting them together on a compact disk
16 after they are approved. I'll explore the possibility
17 of having the files loaded onto a CD-ROM.

18 You wouldn't have the benefit of the
19 electronic book features with tables of contents and
20 so forth but if you're more comfortable in working in
21 electronic forms, we can have Word Perfect files
22 assembled on a CD for portability.

23 DR. SHACK: How about PDF?

24 MR. GRIMES: I hesitate to say that because
25 we would have to pull the PDF files out of ADAMS and

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1 I would rather not.

2 DR. SHACK: When I get Word Perfect
3 documents from Paul my computer thinks they are PDF
4 files anyway.

5 DR. BONACA: So we'll do that. I just want
6 to ask if there are anymore questions from members.
7 No further questions. With that, Mr. Chairman, I give
8 you this 32 minutes of time.

9 CHAIRMAN APOSTOLAKIS: The Chair expresses
10 deep gratitude.

11 We were hoping to go over the ATWS letter
12 because we have a new version of it. No, we don't
13 need the description now.

14 (Whereupon, at 11:14 a.m. off the record for
15 lunch to reconvene at 12:46 p.m.).

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

2 12:46 p.m.

3 CHAIRMAN APOSTOLAKIS: We are back in
4 session. I neglected to mention this morning that we
5 have Dr. Peter Ford sitting with us at the table as an
6 invited expert.

7 The next session is on Spent Fuel Pool
8 Accident Risk at Decommissioning Nuclear Power Plants.

9 Dr. Kress, you are the leader on this.

10 DR. KRESS: Yes. It's a simple,
11 noncontroversial subject.

12 CHAIRMAN APOSTOLAKIS: We should be done in
13 five minutes then.

14 DR. KRESS: As you all recall, there was a
15 technical study on this issue intended to give
16 guidance on how to develop a rule or exemptions to
17 relax requirements at spent fuel pool, requirements on
18 emergency preparedness, and perhaps insurance
19 requirements and security requirements.

20 We reviewed that technical study and give it
21 fairly good grades, I think. They determined that the
22 risk after a certain amount of time was low enough
23 that you could do without the emergency preparedness
24 and still meet the safety goals and this risk was done
25 a fairly conservative basis.

1 They also noted that previous exemptions for
2 these sort of things were based on the concept that
3 you couldn't have a zirconium fire after a certain
4 time because the heat generation rate was too low. It
5 was balanced by the cooling rate so that you weren't
6 hot enough to start a fire.

7 The staff to some extent backed away from
8 that concept and said they couldn't exclude the
9 zirconium fire, whatever that means. I think there
10 was some differences of opinion between the industry
11 and the staff on these things. There have been some
12 further correspondence and some discussions.

13 I think today I view this as more or less a
14 status report or an update on where we are with
15 respect to publications on possible rule making
16 options. I don't think we are ready for a letter
17 again this time. I don't know. It depends on what we
18 hear.

19 With that as a sort of vague introduction,
20 I'll turn it over to Tim Collins of NRR to get us
21 started.

22 MR. COLLINS: As a status report this will
23 be a real quick meeting. The status report is that
24 the study is done and we're starting to do the
25 thinking on the policy options.

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1 There are a couple of things, though, I
2 would like to provide a little clarification on. When
3 we started out the study, the charter was not just
4 aimed at EP and insurance. It was to provide a broad
5 basis for rule making relative to decommissioning
6 plants as a whole.

7 There was some emphasis in the report on EP
8 because of the number of exceptions that had been
9 granted in the past and the most recent actions in
10 decommissioning were requests for exemptions in
11 decommissioning or insurance.

12 Another thing I would like to make a
13 clarification on. The finding in the report with
14 regard to not being able to preclude a zirconium fire.
15 The finding in the report was really that we couldn't
16 define a generic time without numerous constraints,
17 okay?

18 The original exemptions were granted on the
19 basis of an unobstructed airflow calculation, those
20 previous exemptions which said after a certain number
21 of years you wouldn't get to a temperature that would
22 lead to a fire.

23 When we originally tried to do the study, we
24 started out with the unobstructed airflow cases. In
25 the course of public comment there was questions

1 raised with regard to partial uncovering of the fuel
2 which would obstruct airflow.

3 We also in trying to do our own calculations
4 we were trying to decide how much airflow we should be
5 using. We ran into problems with different rack
6 configurations, different spent fuel pools, the
7 relationships between the building airflow and the
8 flow in the racks.

9 Then when we looked at our results, we said
10 the most likely events that could get you into trouble
11 were major seismic events and major cast drops, all
12 catastrophic events. We finally threw up our hands
13 and said we can't define the geometry which will allow
14 us to do as calculation which will give us a generic
15 decay heat time.

16 I think the characterization that the study
17 concluded that you could never preclude it is a little
18 bit of an alarming characterization. It's more a
19 matter of, well, there are so many uncertainties and
20 so many unknowns in trying to do a generic analysis
21 that we couldn't come along and say after five years
22 we're sure there's not going to be a fire.

23 As far as where we go now, I mean, as far as
24 any technical work goes, it's at a standstill. We
25 believe that the results of the report were -- the

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1 staff is comfortable that we are below the safety
2 goals. We think that additional technical work could
3 be quite expensive if it's going to really
4 significantly reduce uncertainties further.

5 We're not sure what goal we would be
6 shooting for if we started to do that work so we're in
7 the position of developing policy actions for the
8 commission. The policy actions are aimed at questions
9 like how important is factors like public confidence
10 in your decision making process.

11 I mean, we believe that the risks are very
12 low and below the safety goals for reactors, but there
13 is a very significant question in areas like emergency
14 preparedness, how important of a factor is public
15 confidence and how does that weigh into decision
16 making. These are the types of things we are going to
17 address in our May paper to the commission. There is
18 also questions of how do we use risk in security
19 related --

20 CHAIRMAN APOSTOLAKIS: I'm sorry. This
21 issue of public confidence, maybe we can clarify it a
22 little bit. You see, you believe that the risk is
23 low. When you say that, you mean the whole
24 distribution is below the goals or the mean value is
25 below the goal but there is a tail that goes perhaps

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1 above?

2 I'm trying to understand the meaning of the
3 statement and why some other groups might differ, I
4 mean, with the issue of confidence. When the staff
5 says the risks are low --

6 MR. COLLINS: When we did our analysis, we
7 tried to use a range of sensitivities. For example,
8 in the seismic analysis we used the Livermore curves.
9 We used the EPRI curves. We did source term
10 sensitivities to include large amounts of ruthenium
11 release, what we thought was a reasonably large
12 fraction of fuel finds. Using those bounds, we
13 believe that the risk is still below the safety goal.

14 CHAIRMAN APOSTOLAKIS: You did not quantify
15 the uncertainty?

16 MR. COLLINS: We did not quantify the
17 uncertainty.

18 CHAIRMAN APOSTOLAKIS: Just sensitivity
19 studies?

20 MR. COLLINS: That's correct.

21 CHAIRMAN APOSTOLAKIS: And what you thought
22 were bounding analysis?

23 MR. COLLINS: Yes.

24 CHAIRMAN APOSTOLAKIS: Okay.

25 DR. POWERS: It must surely be if the risks

1 are low and you use high source terms, that is, just
2 the frequencies were low. That's the only reasons.

3 MR. COLLINS: Sure. I mean, the frequencies
4 were very low.

5 CHAIRMAN APOSTOLAKIS: The frequencies of
6 what?

7 MR. COLLINS: The frequency of -- what we
8 calculated in the report was the frequency of uncovering
9 of the fuel. We didn't try to do a calculation of the
10 conditional fire probability. We went from uncovering
11 of the fuel to consequence analysis.

12 DR. KRESS: And it was driven by seismic.

13 CHAIRMAN APOSTOLAKIS: So why would someone
14 else then have less confidence in what you did?

15 MR. COLLINS: Let's find that someone else
16 and ask them.

17 CHAIRMAN APOSTOLAKIS: I mean, how can you
18 take into the decision making process the fact that
19 others have less confidence in your results unless you
20 understand why? You raise the issue of how do we make
21 a decision if the public doesn't agree with us. Who
22 is the public anyway?

23 DR. POWERS: I think we have to go back and
24 look at what some of the other speakers had to say.
25 We had several speakers at our meetings and some of

1 them -- the universal sentiment was that the issue
2 deserved more attention.

3 When you looked at the more attention that
4 they were asking for, in general each person said that
5 there are design specifics at each site that make a
6 generic conclusion difficult to draw. You have to go
7 look at those design specifics and they make a
8 different.

9 Now, the difference they were asking for, of
10 course, depended on point of view a little bit. So
11 one of the questions that comes out of that is does
12 the generic analysis give you the answer or is it
13 always the site specific analysis that you have to do?

14 The other distinct point of view was that
15 looking at this strictly from an accident probability
16 is the wrong way to do it. In fact, there is a
17 security element of this as well so you have to take
18 into account both misadventure and deliberate actions
19 here in making decisions about these pools. Those
20 were the alternatives.

21 The one I think the staff is in a position
22 to address is the one can you get any mileage out of
23 a generic analysis or are all things so site specific
24 in the phenology affected by that site specificity
25 that you just don't derive any answer.

1 MR. COLLINS: I mean, certainly in the
2 development of a rule if we were depending upon
3 generic analysis, one of the elements of the rule
4 would have to be demonstrating consistency with the
5 generic analysis, or that you were bounded by the
6 generic analysis, or you would do your own plant
7 specific analysis. That's typically what we do with
8 rules anyway.

9 We review topical reports all the time where
10 generic analysis are submitted and then we get a plant
11 specific submittal which references the generic report
12 and just demonstrates why it's founded by the generic
13 analysis or where it's not and why it's still okay.
14 The rule would have to be structured in such a fashion
15 if it's going to depend upon --

16 DR. POWERS: You can do that in a rule but
17 I would think you would come into the rule saying, "My
18 generic analysis is going to be pretty good or 90
19 percent of 90 percent of the site specific things."
20 Do you have any feeling for that?

21 MR. COLLINS: This analysis?

22 DR. POWERS: Yes.

23 MR. COLLINS: I think this analysis would be
24 applicable to most facilities, yeah.

25 DR. POWERS: Okay. That gives the answer

1 the chairman was looking for. It's contrary to what
2 speakers on both sides of the issue have said.

3 MR. COLLINS: Well, I understand that. In
4 some cases on one side of the issue speakers would say
5 that the risk is so much lower. That's fine. That's
6 okay. If they want to do analysis which shows it's
7 lower, we'll find that just as acceptable.

8 CHAIRMAN APOSTOLAKIS: Are you done?

9 MR. COLLINS: I think I'm pretty much done.
10 I mean, there's not much more to say. We just started
11 developing the policy paper.

12 DR. KRESS: That's going to the
13 commissioners in May?

14 MR. COLLINS: Yes.

15 DR. KRESS: Near the end?

16 MR. COLLINS: I expect it will be about May
17 31st.

18 DR. KRESS: We could probably here a draft
19 version of that in our May meeting, you think?

20 MR. COLLINS: Well, a different group is
21 responsible for the development of that paper. I
22 don't want to commit them.

23 DR. WALLIS: So have you concluded the
24 better understanding of the physics, chemistry, and so
25 on of fires is not to be sought because the risk is so

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1 low?

2 MR. COLLINS: Staff is not recommending that
3 we do additional analysis at this point. If the
4 commission decides that we need it, we'll do it.

5 DR. KRESS: I think there are broader
6 applications or needs for such stuff. For example,
7 with respect to pressurized thermal shock, which may
8 be an iron ingression type accident also. There may
9 be other reasons other than for decommissioning for
10 such research but you're not excluding that in
11 particular?

12 MR. COLLINS: No.

13 DR. KRESS: Just for the decommissioning?

14 MR. COLLINS: I'm talking about for
15 decommissioning rule.

16 DR. KRESS: I think you probably have enough
17 for a decommissioning rule maybe.

18 DR. POWERS: I guess I have a couple of
19 questions on that. One of them I would like to come
20 back to is the statement that things are dominated by
21 seismic.

22 I have been given a sheet of paper which,
23 unfortunately, I don't have right here with me, in
24 which initiating events for fires in the pool were
25 listed down and the percentage contribution was

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1 provided. That list of seismic only is 13 percent.
2 It wasn't even top on the list and there were several
3 comparable to it.

4 Naturally enough, I can't remember what the
5 others were but they certainly involve station
6 blackout, loss of cooling capabilities.

7 Is it true that this thing is totally dominated by
8 seismic?

9 MR. COLLINS: We believe the seismic clearly
10 dominates it. We took into account events where you
11 had loss of cooling to the pool. You can look at it
12 as two basic types of events. You have a catastrophic
13 draining of the pool or you have a slow boil off or a
14 very slow leak, those two types.

15 Now, the second type of event, the slow one,
16 is dominated by human error and there's hundreds of
17 hours for recovery actions in the secondary. We
18 looked at that very carefully. We had several back
19 and forths with the industry and I think with the
20 committee even on the human error assessment. When we
21 were finished, we found that the seismic events were
22 dominating.

23 DR. WALLIS: Well, human intentional error
24 like deliberately turning on pumps which would drain
25 pools or something like that?

1 MR. COLLINS: Errors of commission as
2 opposed to errors of omission.

3 DR. WALLIS: It might well be that your risk
4 levels are so low that the unexpected wayward
5 performance of one individual might have --

6 MR. COLLINS: Still the recovery time was
7 important more than the initiating event frequency if
8 it was started by someone turning on a pump.

9 DR. WALLIS: So they cannot drain the pool
10 rapidly? It takes many days or something? I don't
11 know.

12 MR. COLLINS: It depends on how big the pump
13 is, I supposed.

14 DR. WALLIS: That's right. That's an
15 obvious statement. How long does it take?

16 MR. COLLINS: I'm not sure if we looked at
17 someone deliberately pumping the pool out.

18 DR. WALLIS: But you may have risk levels so
19 low that that sort of event is the thing you have to
20 worry about.

21 DR. POWERS: You are ham strung. You have
22 no way of estimating the probability of that
23 initiator.

24 DR. KRESS: That's right.

25 DR. POWERS: That's the fundamental problem.

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1 The ground rules on any kind of risk is that risk is
2 going to be taken out. That, of course, means that
3 somebody has to say those kinds of risks are handled
4 some other way or are small enough that I don't need
5 to worry about them.

6 We have the same problem with sabotage,
7 somebody from the outside attacking the pool. We try
8 to handle that by putting fences up and a few guards
9 and things like that.

10 Similarly the kinds of people that you hire
11 have some sort of screened background and don't have
12 a predilection for sticking pumps into spent fuel
13 pools or something like that. Those kinds of measures
14 are taken. You can't put it into a probalistic frame
15 work.

16 DR. KRESS: You cannot put it into a
17 probalistic frame work?

18 DR. POWERS: People certainly haven't found
19 any way. What they have found is I can produce an
20 estimate of the probably of an error commission. What
21 I can't do is produce an estimate that I can persuade
22 Tom is correct.

23 DR. KRESS: That's correct.

24 DR. POWERS: I can do it.

25 DR. KRESS: It can be done.

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1 DR. POWERS: But I can never persuade you.
2 Now, one could imagine that you could sit down and
3 have a panel of experts persuade each other what it
4 is.

5 The problem is no one ever felt like they
6 could take that product and put it forward and
7 convince anybody that these people were so profound in
8 their expertise on people sticking pumps in spent fuel
9 pools that their estimate was better than anybody
10 else's.

11 MR. LEITCH: In terms of error by omission,
12 it seems to me, and my memory is a little fuzzy, but
13 in Dresden about four or five years ago there was a
14 freeze up and I think a line had ruptured in an
15 attempt to drain the spent fuel pool. Did you think
16 about things like that?

17 MR. COLLINS: Yes, we tried to look at all
18 the operating events that we were aware of that could
19 have led to a pool draining. It's considered in the
20 likelihood of the initiating event.

21 DR. KRESS: We went over all these questions
22 when we reviewed the technical study. We convinced
23 ourself that they did a pretty good job.

24 CHAIRMAN APOSTOLAKIS: Do you want to say
25 something about the options? Please identify

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1 yourself?

2 MR. HUFFMAN: My name is Bill Huffman. I'm
3 with NRR and I'm the project manager for the policy
4 paper. I think your question was would it be ready
5 for a briefing the first week of May. I would hope it
6 would be in a draft stage at that time.

7 However, I would say that it would certainly
8 have to be a closed meeting. It's predecisional.
9 It's not something that we want to have the public
10 privy to before we went to the commission on. Plus,
11 there would probably be safeguard information.

12 CHAIRMAN APOSTOLAKIS: I don't understand.
13 Don't we always review things that are predecisional?

14 DR. KRESS: Yeah, but he also brought up the
15 safeguards.

16 CHAIRMAN APOSTOLAKIS: Okay. Okay.

17 MR. HUFFMAN: My schedule right now did not
18 factor in briefing ACRS and I'm not sure exactly what
19 a lead time you would want on the draft.

20 DR. KRESS: About a week.

21 CHAIRMAN APOSTOLAKIS: Thirty days.

22 DR. KRESS: In this case we'll make an
23 exception. Two weeks.

24 CHAIRMAN APOSTOLAKIS: How big is it going
25 to be?

1 MR. HUFFMAN: Fifteen pages.

2 CHAIRMAN APOSTOLAKIS: Two weeks then is
3 reasonable.

4 MR. LEITCH: Are there not certain
5 decommissioned plants now that have spent fuel pools
6 where they have backed off on emergency preparedness
7 and security?

8 MR. COLLINS: Yes. We've granted exemptions
9 to several plants for emergency preparedness,
10 insurance, and security.

11 DR. KRESS: And those were generally based
12 on the problem that they couldn't have a fire after a
13 certain amount of time?

14 MR. COLLINS: It seems each exemption was
15 granted for a different reason. Generally, though,
16 often a part of the basis was the fact that you
17 couldn't have a fire anymore based on an assumption of
18 unobstructed airflow calculation.

19 DR. KRESS: Then you don't feel like you
20 need to revisit those because the risk is low.

21 MR. COLLINS: No, we intend to go and
22 revisit them. We believe that the risk is low enough
23 there's not a safety concern with those. We were
24 maybe in a situation where the basis is not correct
25 for the exemption. We plan to revisit those. In all

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1 cases, I think the most recent -- the freshest fuel is
2 almost four years old in the facility with the hottest
3 fuel.

4 DR. KRESS: Long time.

5 MR. COLLINS: A long time.

6 DR. KRESS: I think we are also scheduled to
7 hear from the industry.

8 Lynette, are you going to take the lead on
9 this?

10 This is Lynette Hendricks with NEI and our
11 old friend Bob Henry with Vaski and Associates.

12 MS. HENDRICKS: We appreciate the
13 opportunity to revisit this issue with you. We see
14 it, I guess, in maybe a little more of an evolutionary
15 stage than maybe the staff views it.

16 We would like to basically talk about two
17 issues today. One are some of the little touch on the
18 phenology questions that were raised last time. Some
19 information on the basis for the cask drop. Then
20 finally with great boldness I would like to have a
21 short discussion and get some input on the seismic
22 question.

23 With that, I'll turn it over to Bob.

24 MR. HENRY: As Lynette said, we would like
25 to offer some suggestions because we think there are

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1 some issues that can be dealt with a little more
2 crisply in the report and take advantage of a lot of
3 the experimental data that has been acquire by both
4 the NRC and the industry over a number of years.

5 I would like to be constructive in that
6 regard and offer some suggestions of things that could
7 be incorporated in the report. As Lynette said, at
8 the end she has some comments on seismic. The issues
9 I would like to particularly address to start with
10 would be the experimental basis that we could
11 subscribe to catastrophic events to get a somewhat
12 better perspective of the potential damage that could
13 really cause.

14 The last time we had the opportunity to
15 visit with you we talked a little bit about fission
16 product release, particularly ruthenium under those
17 conditions where the pool has been assumed to be
18 drained rapidly.

19 The at the end also talk perhaps a little
20 about suggested peer review to make sure that all of
21 the data that people have at their disposal gets input
22 into these kinds of documents that do get used for
23 policy making.

24 I should also say we're talking about the
25 cask drop here just as Tim was just saying. We are

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1 focusing on the likelihood that could be a mechanism
2 whereby the pool would be rapidly drained. There is
3 some data that I'll share with you here that I think
4 the study could benefit from by incorporating and
5 suggest that this is a pretty difficult thing to do.

6 To start with, we feel that the status is
7 that this provides a good start for quantifying the
8 risk for significant fission product releases. We
9 think it's certainly a good basis. Tim was just
10 talking about all the field information they went
11 through to provide quantification of the likelihood of
12 losing pool cooling.

13 We also believe it should incorporate these
14 experimental results, I was mentioning, that one could
15 use to evaluate the likelihood that a cask drop could
16 indeed cause rapid draining of the pool.

17 Also, we believe that there is a technical
18 basis to be incorporated into the report to at least
19 give a best estimate in addition to the bounds that
20 are already in for fission product releases and,
21 therefore, health consequences.

22 I think if we do a little bit more than just
23 provide the bounds, we provide some additional
24 insights on how people might be using this to make
25 judgments.

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1 To start with, let's start with the
2 experimental basis for assessing cask drop. I've
3 listed four references I was able to dig up. The
4 first two being with full-size casks dropped onto
5 concrete pads where they were principally there to
6 measure the damage to the cask, but they also recorded
7 the damage to the concrete. We can certainly use that
8 to assess our ability to determine how tough the
9 concrete really is.

10 The third one is an NRC study using steel
11 billets dropped onto concrete surface that is very
12 useful. However, the first two I'll use this
13 afternoon because the information for the compression
14 of the concrete in the locality impact is reported.

15 The last one are some experiments that were
16 done quite a while ago for high velocity impacts that
17 really relate to tornado missiles but from a practical
18 point of view they are just as usable, as we'll see,
19 as the first two in terms of assessing what the
20 implications would be for impacts on concrete.

21 DR. WALLIS: When you talk about a pool,
22 what part of the pool is being hit by this cask?

23 MR. HENRY: Conceptually, just think that
24 the cask has been lifted up and is somewhere around
25 the top of the pool, the rigging breaks and it comes

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1 down through the pool.

2 DR. WALLIS: Through the pool of water?

3 MR. HENRY: Goes through the water.

4 DR. WALLIS: Doesn't that slow it down quite
5 a bit?

6 MR. HENRY: It does a little bit. We'll
7 talk briefly about that. To give you a feel for it,
8 the terminal velocity of water is maybe in the range
9 of 20 meters a second if you just use a drag
10 coefficient of one. You'll see this has fins on the
11 side and maybe that slows it down a little bit more.
12 The 20 meters a second --

13 DR. WALLIS: In your picture, it goes
14 through the pool and hits the bottom of the pool.

15 MR. HENRY: Correct.

16 DR. WALLIS: It's not knocking off a piece
17 of the sidewall or anything?

18 MR. HENRY: In what I present today, no, but
19 this fourth set of experiments here do have
20 experiments where the projectile was at a 45 degree
21 angle also. I didn't include those here because this
22 is a fairly quick thing but you could certainly use
23 those. What they did observe in those is that it
24 principally just grazed along the side and didn't do
25 anything to cause a large rupture of the wall.

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1 I apologize for the simplicity of this.
2 There are correlations for this. I chose not to get
3 into correlations but to just use it from a very
4 fundamental point of view in terms of the mass and how
5 far it's going to fall, plus the strength of the
6 concrete and the dent it will make in the concrete
7 delta and the kinetic energy.

8 All this does is equate the change in
9 kinetic energy to the work done and the work is just
10 the force of compressing the concrete times delta.
11 This delta is the dent that it would make in the
12 concrete or how far it has to go into it before we
13 finally can get something that actually opens up a
14 hole that could drain the pool very quickly.

15 DR. WALLIS: The biggest uncertainty is A.
16 I mean, how does it fall. Does it fall in a corner.
17 We have to put in an A here. That's the biggest
18 uncertainty.

19 MR. HENRY: Again, I didn't focus on that
20 today. I wanted to make sure the database was
21 available to everybody and understood and discussed.
22 Again, going back to the tornado missiles, they used
23 As which were very small like rebar.

24 The part that I'm going to give you here is
25 a very simple approach I'm going to use. As you start

1 making A smaller and smaller, this thing starts giving
2 you far too deep of a penetration.

3 If you think of a corner going in first,
4 then it's very quickly going to spread to something
5 which is, let me say, is just half of the A of the
6 total cask. Again, we're not close to any kind of
7 cliff where you would almost break the pool as we'll
8 see here.

9 DR. WALLIS: You are assuming that energy is
10 absorbed by the concrete where it's hit.

11 MR. HENRY: Right.

12 DR. WALLIS: I think sometimes when you hit
13 concrete on one side the concrete comes off on the
14 other side but the shockwave goes through the wall,
15 hits tension, comes off the far side of the wall. It
16 hits the wall here and the plug of concrete goes out
17 into the next room.

18 MR. HENRY: Right.

19 DR. WALLIS: But that wouldn't be reflected
20 by this kind of mechanism. Would it?

21 MR. HENRY: It is in the way I'm going to
22 use it as you'll see because we're going to go back to
23 data where actually what did it take for something to
24 fly off the opposite side.

25 DR. KRESS: The compressive strength, that's

1 force per unit area it takes to compress concrete a
2 certain distance?

3 MR. HENRY: Yeah, if you want to use a
4 simple kind of thing, it's like the yield point. Once
5 it starts giving, it essentially has almost the same.
6 Also there is a rate of strain that gets involved in
7 all these, of course, but that's also not in here.

8 When I talk about the calculated delta, it's
9 going to be this very simple thing of just equating
10 the kinetic energy to the work done.

11 DR. WALLIS: That's an interesting one, too,
12 because if you want to bust concrete, it depends on
13 the size of your sledge hammer. Having the same
14 amount of kinetic energy with a sledge hammer that
15 weighs a ton isn't the same as having one that weighs
16 nine pounds. It makes quite a difference.

17 MR. HENRY: That's correct. That's
18 obviously all in the equation. If you do go back to
19 this part of it and if you want to scale it then
20 you've got this thing and here is the mass and the
21 area that you've been focusing on.

22 If you want a scale from one to the other,
23 my mass and area might be different and can I make up
24 for it with a different velocity to get the right kind
25 of energy. We'll get back to that in a minute.

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1 These are the full scale tests and the
2 results of these tests for the cask drop experiments
3 that were done by BNFL at Sandia and also at AEA
4 Winfrith. As you can see, this is a pretty big
5 hammer, 64.5 tons.

6 The concrete's compressive strength was 22
7 MPAs with something in the range of like 3,500 or
8 3,600 psi. The drop itself -- excuse me for a second
9 because I do have color photographs that aren't in
10 what you have. I have six of each here if you want to
11 pass these around and share a little bit with each
12 other. There's three different photographs.

13 DR. WALLIS: This is a big flat hammer.
14 Isn't it?

15 MR. HENRY: Yeah.

16 DR. WALLIS: You're really spreading the
17 load.

18 MR. HENRY: That's why it's also --

19 DR. WALLIS: It's a pretty expensive hammer.

20 MR. HENRY: This is the apparatus. It
21 weighs 64.5 metric tons. In this case it's held 60
22 inches above the surface of this reinforced concrete
23 block and about to be dropped.

24 When it is dropped, this is the dent, the
25 impression that's made on the concrete from the

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1 highest drop of 60 inches. Here you can see the ring
2 that's left in the concrete.

3 Then also this is the measurement of the
4 deepest part of the ring which shows that the
5 impression is eight millimeters. As we talk through
6 this, it's that impression I'm talking about.
7 Obviously for the first set of tests --

8 DR. WALLIS: Great care has been taken to
9 spread the load as much as possible here.

10 MR. HENRY: I think that's why you have to
11 look at all the databases and not just this one.

12 On the first case it was dropped 18 inches.
13 If you go through the simple analysis you calculate a
14 value of eight millimeters and it measured at the
15 deepest point four millimeters of imprint and
16 obviously some cracks in the concrete. But nothing
17 was -- I mean, this is sitting on soil so nothing was
18 broken off the other side.

19 In the third test it was dropped 40 inches.
20 Here you can see that the simple way you look at
21 things begins to fall apart a little bit but it still
22 gives you a perspective. You calculate that you would
23 make a dent about 17 millimeters deep or 1.7
24 centimeters and they measured six millimeters.

25 The last one, which is the picture I showed

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1 you, they dropped it 60 inches, they calculated 26
2 millimeters and they measured, as we saw in the
3 measurements in the figure, eight millimeters.

4 DR. WALLIS: Doesn't the whole business of
5 impact impedance come into this, that if the concrete
6 mass is -- it's not infrared mass so you actually set
7 it in motion when you hit it. It's a fairly
8 complicated problem. It's not just a question of
9 absorbing energy and a distance.

10 MR. HENRY: Obviously the basic thing you
11 have to do is absorb the energy somehow. How it all
12 gets absorbed is more complicated than what this
13 simple explanation shows.

14 DR. WALLIS: When you hit a base ball, it's
15 different from hitting a wall. The baseball moves.

16 MR. HENRY: Right. From a practical point
17 of view, the same thing is true in a plant. I mean,
18 if it does hit the wall, the wall will bend and push
19 it back up again.

20 This, at least, gives us a perspective. We
21 can go to these other tests where it is much more
22 focused in terms of the load. The first thing here is
23 you see it takes a big wallop to put a hole in the
24 concrete.

25 The next one, I have taken three of those

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1 tests and shown them here. I've taken the tests which
2 are the same missile all the time which is a 12-inch
3 pipe and propelled at different velocities.

4 They also have a three-inch pipe and a one-
5 inch pipe but there's only a couple of tests of each
6 where this gave us a number of tests to look at
7 different velocities, three of which I've just showed
8 you here.

9 If we go through the same kind of analysis,
10 now the missile is at much higher velocity, as you can
11 see, upwards of over 200 feet per second when it hits
12 the concrete. I put three of them in here because the
13 first one is with 12 inches of concrete and this is a
14 velocity which is big enough to drive a hole right
15 through the whole thing.

16 If you look at the next sheet, that's a
17 picture of the front and backside. The frontside
18 still has the pipe sticking in it and the backside you
19 can see the concrete that's blown off the back.

20 You want to make sure you understand what
21 does it take to do this because these experiments tell
22 you that it takes a certain amount of kinetic energy
23 for a particular thickness of reinforced concrete.

24 The first one I have on test No. 10 is
25 sufficient to penetrate the entire wall. Test No. 12

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1 then is 18 inches. This is 203 feet per second, same
2 kind of missile. Now you would calculate something
3 that's in the range of almost a foot of penetration.
4 The real penetration is about 7.5 inches but it is
5 enough to start pushing some material off the back.

6 This again now is what the frontside looks
7 like. You can see it's removed all the concrete right
8 down to the first row of rebar. The backside you can
9 see that it has spalling or scabbing off the back and
10 you can see the exposed rebar. Maybe you would have
11 a reasonable leak through that. You wouldn't know for
12 sure.

13 Then the last one is 18 inches at 143 feet
14 per second. This one I use, and we'll come back to it
15 again, because there's no spalling off the back face
16 at all on this one. Here you would calculate a
17 penetration depth by the simple approach of 18
18 centimeters and the actual measured value was more
19 like five inches. Reasonably close.

20 This one is important because it gives you
21 a frontside which looks like this again, very similar
22 to the others, but the backside -- I apologize. This
23 is very dark but it's the best copy at the time --
24 there's just some minor cracks. This is not something
25 that would drain the pool rapidly.

1 Again now we can work backwards and say what
2 is the criteria now that we ought to be using to
3 determine whether or not we have an impact that can
4 push something off the backside and open up a whole.

5 I took all the information that was
6 available on the 12-inch pipe so each one of these is
7 the same missile. I oriented them in terms of
8 increasing velocity here but you have to realize there
9 are also some other things changing.

10 A minor thing that changes is the strength
11 of the concrete because that depends upon the pore and
12 what they were trying to do for a particular test.
13 The concrete thickness is also changing. That goes
14 all the way from 12 to 24 inches.

15 I've listed here the measured penetration,
16 the calculated penetration, and then the ratio of the
17 calculated penetration to the total thickness. Then
18 the results over here on the right-hand column. These
19 two I've highlighted halfway through the table and at
20 the end so test No. 10 and 18 had complete
21 penetration.

22 Here you can see that the calculated value
23 is over half of the thickness of the wall. That's
24 when you can begin to think that, just as Graham said,
25 you've got enough reaction on the back surface that

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1 you would open that up and then you would not be able
2 to convince yourself that you did not have a complete
3 path to drain the pool.

4 But these others that are very slight,
5 0.20 - 0.25, thirty percent of the calculated
6 thickness, hardly anything was observed on the
7 backside at all.

8 DR. WALLIS: If I really wanted to drain the
9 pool, I would drop something on the pipe.

10 MR. HENRY: Most of them have pipes that the
11 suction is on the inside.

12 DR. WALLIS: Penetration is on the bottom,
13 right?

14 MR. HENRY: I don't know about all of them.
15 The older ones may. Some may have that.

16 This is now what I use to formulate a basis
17 to say, okay, if we have enough energy that we could
18 penetrate something that begins to approach half of
19 the wall, they would have to think that we could force
20 a leak through the entire wall. That's just
21 summarized on this.

22 It says first we have the large-scale tests
23 which give us an idea of how well the simple
24 representation characterizes what was observed in the
25 concrete within a factor of two or three so that's a

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1 good start. As I say, there are correlations for
2 these things. I don't want to confuse it with
3 correlations and get right down to the gut physics of
4 control.

5 DR. WALLIS: You would be extrapolating. If
6 you dropped a cask, it could well drop more than 60
7 inches.

8 MR. HENRY: Yeah, I'm going to get to that,
9 too.

10 DR. WALLIS: You've got to use some kind of
11 correlation to go up to that.

12 MR. HENRY: That's also why those high
13 velocity pipe tests give you kinetic energy a specific
14 loan that is greater than what you have even if it was
15 the terminal velocity in the cask.

16 The observations from the high velocity
17 missile tests, I think, are quite important and they
18 give you an idea of how you can scale up to the things
19 that are of interest because we do have to consider
20 dropping from things in the range of nine meters.

21 We find that only relative small cracks
22 appear on the backside as long as the calculated
23 penetration is less than half of the wall thickness.
24 If we don't have spalling off the backside, we
25 wouldn't expect any large leakage from the pool.

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1 Therefore, we ought to have something that
2 is relatively easy to make up and slow drainage of the
3 pool, which I think are some important insights to put
4 into the physics side of the study because that is, as
5 Tim said earlier, one of the mechanisms for rapid
6 draining of the pool. It's in the study.

7 Now, what does this mean for the actual
8 cask? The height that has to be used in the spent
9 fuel pool is something like nine meters. I use nine
10 meters here. Maybe it's 10 meters or whatever the
11 particular event is.

12 It should include obviously the buoyancy and
13 the drag of the water and the buoyancy reduces the
14 acceleration by about a meter per second. If you just
15 take a dry coefficient of one, as Graham was asking
16 earlier, you get to something in the range of 20
17 meters per second is the terminal velocity.

18 The impact through water of a nine meter
19 drop gives you a velocity of about 12 meters per
20 second. That's only twice what you observed in this
21 one that I passed around. Kinetic energy wise, you're
22 only talking about a factor of four up from that
23 particular experiment.

24 If I go to the experiment and say I might
25 expect something that's about four times as deep as

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1 what I saw, I'm only talking about maybe three
2 centimeters whereas the calculated value would be in
3 the range of 12.5.

4 DR. POWERS: Bob.

5 MR. HENRY: Yeah, Dana.

6 DR. POWERS: Maybe some stupidity on my
7 part. You drop the cask and it's going at some
8 velocity and hits the water. How long does it take
9 for that velocity to full up to the terminal velocity?
10 I presume that the terminal velocity in the air is a
11 lot higher.

12 MR. HENRY: Oh, terminal velocity in the air
13 is a lot higher.

14 DR. POWERS: Yeah, so that when it hits the
15 water, it's going faster than the terminal velocity.

16 MR. HENRY: It's barely above the water pool

17 DR. POWERS: Okay. So you're saying it has
18 almost no velocity when it hits the water?

19 MR. HENRY: Has almost no velocity.

20 DR. POWERS: Okay.

21 MR. HENRY: The acceleration is principally
22 through the water.

23 DR. POWERS: Okay.

24 MR. HENRY: Just to answer your question to
25 the extent that you asked it, you're at 12 meters. It

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1 would take quite a bit longer obviously to get to 20.
2 At this point the drag is roughly half of the
3 acceleration. So now if --

4 DR. WALLIS: It also has an added mass.

5 MR. HENRY: You mean the divirtual mass?

6 DR. POWERS: Yeah, but, Graham, give him a
7 break. Yeah, Bob, correct that in your calculations.

8 MR. HENRY: Sure.

9 DR. POWERS: He doesn't have any decimal
10 points.

11 MR. HENRY: Everything we have comes out of
12 one dimensional and two-faced.

13 DR. KRESS: The added mass is taken care of
14 in the terminal velocity.

15 MR. HENRY: When you get to terminal
16 velocity it's just equilibrium.

17 DR. POWERS: Tom, you're correct if he
18 measured the terminal velocity on the cask but since
19 he's just calculating it, it doesn't take the added
20 mass.

21 MR. HENRY: The chairman told me to move on
22 here. The pool itself -- the bottom of the pool is
23 anywhere from 1.5 to 2 meters thick. My point here is
24 even the calculated value is an order of magnitude
25 less than the full thickness so putting all the

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1 database together whether -- I apologize.

2 I took the rebar out because in essence it
3 has even less penetration than the pipe does for the
4 same kind of specific impulse. I could have put that
5 in also as a low.

6 When you put in the total database, you come
7 to the conclusion that it's going to be extremely
8 difficult for dropping a cask the full height of the
9 water pool to end up with something that's able to
10 open up the backside of the pool even if it's not
11 sitting on soil.

12 Some of these are sitting on either bedrock
13 or soil. Others are elevated. This tells you, I
14 think, that this concrete is very, very tough against
15 these kind of impacts.

16 DR. KRESS: What contribution did the staff
17 have for cask drops and draining the pool in their
18 technical study? Was it significant enough to worry
19 about?

20 MR. HENRY: It was significant enough to
21 worry about.

22 MR. COLLINS: Two times 10 to the -7, the
23 likelihood of a uncovering of the pool due to a cask
24 drop, two times 10 to -7.

25 DR. WALLIS: Bob Henry is saying it's zero?

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1 MR. HENRY: I've been accused of saying that
2 in the past. I think what's really important when we
3 do these risk studies is to make sure we represent the
4 available technical basis. I would like to see this
5 kind of information in there.

6 DR. WALLIS: What did the staff use for the
7 mechanical probability with this scenario of the whole
8 development with most of your risk number probability
9 of the cask dropping at all?

10 MR. COLLINS: Most of the number was the
11 probability of the cask dropping at all.

12 DR. WALLIS: If it did drop, you're assuming
13 it went through the bottom?

14 MR. COLLINS: No.

15 MS. HENDRICKS: It was factor 1.

16 MR. COLLINS: No, it was not. It was 1 in
17 10.

18 MS. HENDRICKS: One in 10 was for the wall.
19 It was a factor of 1 if it hits the floor.

20 DR. WALLIS: So you and Bob disagree on the
21 maximum amount possible. You say it's 1 and he says
22 it's zero.

23 CHAIRMAN APOSTOLAKIS: So what's the factor
24 of 1 in 10?

25 MS. HENDRICKS: It's .1 if the cask is

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1 presumed to hit the wall and it's a factor of 1
2 probability of failure if it hits the pool floor. At
3 least that's what in the appendix.

4 DR. KRESS: So you're saying instead of this
5 being 2 times 10 to -7 it ought to be 2 times 7 -8?

6 CHAIRMAN APOSTOLAKIS: Neglectfully small.

7 DR. WALLIS: It ought to be 2 to -14 or
8 something like that.

9 MR. HENRY: I would say the conditional
10 probability ought to be less than 1 in 100 for sure.

11 CHAIRMAN APOSTOLAKIS: Because in this
12 analysis that you have done something that might be
13 wrong or why not zero?

14 MR. HENRY: Every time I used zero in the
15 past you guys jumped all over me.

16 CHAIRMAN APOSTOLAKIS: That's the fun in it.
17 If I look at this and I don't have any other
18 information, I would say zero. Why shouldn't I say
19 zero?

20 MR. HENRY: I would say zero.

21 DR. KRESS: But that doesn't change anything
22 because it was already low enough that they didn't
23 have to worry about it.

24 MR. HENRY: There's a couple things. I
25 won't speak for the conclusion of the study but I will

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1 say in writing the study that cask drop failing the
2 spent fuel pool shows up a number of times as a way
3 that you could rapidly drain the pool.

4 DR. KRESS: Okay. It's a perception.

5 MR. HENRY: Plus the fact I would like to
6 see these things referenced so that we know the
7 database that is used in the physical part as well as
8 the probability part has got a good strong foundation.

9 CHAIRMAN APOSTOLAKIS: So it's a matter of
10 confidence.

11 MR. HENRY: Yeah.

12 MS. HENDRICKS: I think what it also does,
13 too, is you end up going from it's dominated by
14 seismic to it's only seismic. I think that makes you
15 want to look a little more closely at what you're
16 doing to the seismic.

17 CHAIRMAN APOSTOLAKIS: I'm a bit confused
18 now. Dana, you keep telling us there is this table
19 where seismic appears as --

20 DR. POWERS: I showed the committee the
21 table.

22 CHAIRMAN APOSTOLAKIS: Yeah, I remember that
23 so why is it only seismic?

24 DR. KRESS: I don't remember the source but
25 it came out of AEOD.

1 DR. POWERS: The table was given to me. It
2 was repeated to be part of the staff study.

3 DR. KRESS: I don't know what that means.

4 DR. POWERS: It was part of the staff study
5 and it got corrected later or it was part of the staff
6 study and nobody believed it or what, but clearly it
7 would be erroneous to say that it is only seismic.

8 CHAIRMAN APOSTOLAKIS: If the table is
9 correct.

10 DR. POWERS: No, no, no. I don't have to
11 say if the table is correct. I don't have to put that
12 codicil in because there are clearly things that cause
13 pools and concrete things to fail other than seismic
14 event. There are clearly drain-down events that
15 occur. They are just small compared to the seismic is
16 what the staff is saying.

17 MS. HENDRICKS: E to the -8 to E to the -9
18 if you go through the report. The question is whether
19 you keep adding up a lot of small numbers.

20 DR. POWERS: You can add either the -9 for
21 a long time before you get any change of probability
22 here. I mean --

23 DR. KRESS: I can buy the argument for the
24 need to be consistent and have the right perceptions
25 and important stuff even though it probably doesn't

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1 make any difference to the bottom line on how you
2 write the rule. I think there is some value in having
3 a technically sound argument.

4 DR. POWERS: One of the things is you would
5 have to worry about it seems to me in thinking about
6 these pools is they thermally cycle and they are going
7 to thermally cycle a lot during recommissioning.

8 If you don't have stress relief for that,
9 then we're cycling concrete dose fatigue. If you do,
10 then you have to worry about compression of the stress
11 release on them. I mean, there are lots of things you
12 can worry about.

13 DR. KRESS: Thermally cycled because of the
14 outside temperature change?

15 DR. POWERS: Yeah. Actually, it's not the
16 outside temperatures. It's the ground temperature
17 that's going up and down.

18 DR. WALLIS: Bob, did you do the seismic
19 calculation too?

20 MR. HENRY: No.

21 DR. WALLIS: I'm kind of intrigued about the
22 mechanism of failure under seismic loads of such a
23 massive concrete.

24 MR. HENRY: No, I didn't.

25 DR. WALLIS: You can shake a big mass of

1 concrete quite a bit without busting it.

2 DR. POWERS: You can look at the news
3 pictures of the concrete abutments from the 1994
4 earthquake and see it doesn't take much to bust up
5 concrete.

6 DR. WALLIS: It depends what it's connected
7 to and a lot of things.

8 MR. HENRY: One of the things I should
9 mention here that I didn't is in all these things I
10 didn't credit the liner strength which obviously all
11 the new pools have a significant liner on the bottom.

12 Last time we were here we talked a little
13 bit about fission product release so I won't belabor
14 this point.

15 DR. POWERS: I wish you would belabor it
16 enough to tell me why you didn't put the Chernobyl
17 incident on your list here. And explain to me a
18 little bit why we got so much ruthenium release so
19 early in the Chernobyl accident.

20 MR. HENRY: Which was metallic.

21 DR. POWERS: Say again?

22 MR. HENRY: Which was metallic.

23 DR. POWERS: It was metallic afterwards.
24 The release itself almost surely had to be as a oxide.
25 There's just no way to do it any other way. By your

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1 own calculation the vapor pressure is diddly squat at
2 temperatures two times what Chernobyl ever had.

3 MR. HENRY: Yeah, but the temperature of the
4 fuel at the time of the actual --

5 DR. POWERS: Even at that, Bob --

6 MR. HENRY: It's pretty hot.

7 DR. POWERS: If we had, we would have been
8 boiling UO2. I mean UO2 will boil off before your
9 ruthenium will boil off.

10 MR. HENRY: One of the reasons I left
11 Chernobyl off of here was just because of these I see
12 as a lot more technically scrutable that we can get in
13 and exactly better understand the releases and the
14 relationship to zirc.

15 DR. POWERS: There is a little tiny test,
16 Bob, that don't allow the zirc to go up to
17 temperature, melt, and drain away.

18 MR. HENRY: I'm aware of that. I'm not
19 saying these are the final answers. I'm only saying
20 these are an important part of the technical basis.

21 DR. POWERS: Things can happen.

22 MR. HENRY: These type of things can happen.
23 It's just the rate at which it happens. As you know,
24 nobody really knows what the temperature was of the
25 fuel observed at the Chernobyl event.

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1 Plus the fact that nobody is still quite
2 sure what the initial event actually looked like in
3 terms of how it was released because obviously there's
4 an explosion. It's a nuclear explosion and that also
5 scattered the fuel. All those things would influence
6 the rate at which things could be released.

7 These hit home to the issue of having air
8 there and steam which is an important part which is
9 particularly this Oak Ridge test, VI-7, and the CANDU
10 test because they tell us the relationship with these
11 cases where we have oxidation ongoing over a long
12 period of time, what's the role for competing of
13 oxygen with all these reactive metals.

14 DR. POWERS: That's not even close. I mean,
15 they are not even close. The reactive metal is so
16 reactive it will suck the oxygen out of anything
17 before you get to the ruthenium. I mean, I don't
18 think that's an issue. I mean, I don't anybody doubts
19 that ruthenium is an excellent getter.

20 MR. HENRY: Ruthenium or zirc?

21 DR. POWERS: I'm sorry, zirc is an excellent
22 getter.

23 DR. WALLIS: Tell me about the melting of
24 the cladding. Why doesn't the cladding flow?

25 MR. HENRY: I was going to get to that in a

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1 second but certainly the upper part of the cladding in
2 this kind of an event is the thing that oxidizes
3 first. The more it oxidizes the stronger it gets in
4 terms of these events because it has a higher melting
5 temperature. The zirc oxide could sit around for a
6 much longer time and even support the zirc on the
7 inside.

8 DR. KRESS: Yeah, but it's apparently
9 brittle.

10 MR. HENRY: It is.

11 DR. KRESS: It cracks.

12 MR. HENRY: If you give it any kind of --

13 DR. POWERS: You want to be careful about
14 drawing experiences from steam because you get a much
15 higher energy input for unit of oxygen reacted and you
16 get a much less compact oxide.

17 MR. HENRY: I understand. Realize this is
18 steam and air in this.

19 DR. POWERS: A little bit of air wins the
20 battle every time because it's the nitrogen component
21 that is causing the problem.

22 MR. HENRY: I understand.

23 DR. POWERS: It doesn't take much.

24 MR. HENRY: My only point here was we
25 finally get back to analyzing it in a pool especially

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1 for those systems that are only partially boiled down
2 so you've got a "blockage" at the bottom.

3 That's also steam and air because you've now
4 cut off your air supply except for whatever small kind
5 of curve flow you have from the top. That's why I put
6 both of these on here. I think they are very relevant
7 to the database and they are in the report that the
8 staff wrote. They didn't forget about these.

9 Our only point here is that we think it
10 would be very helpful instead of -- I shouldn't say
11 instead of -- in addition to the two boundaries that
12 they have for what the ruthenium release would be
13 let's use this information and also put a third curve
14 on that gives a best estimate.

15 When people look at these two boundaries
16 they have some idea of these two orders of magnitude,
17 whereabouts we think things are most likely to be.

18 DR. KRESS: It generally takes a lot of data
19 to get a best estimate. I'm not so sure we have
20 enough data to call anything a best estimate.

21 MR. HENRY: I would always use the data for
22 something because that's what you know. The bounding
23 parts you've kind of more or less pitched in and said
24 it's got to be between zero and 1. I realize that,
25 Tom, and that's why the two things we're going to come

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1 down to.

2 First off, these are recommendations. And,
3 more importantly, we think this would be a study that
4 should have a peer review because it's not my opinion
5 and it's not any individual opinion around here. We
6 ought to make sure that what's known in the technical
7 community gets shown in this report.

8 DR. POWERS: I guess what I'm struggling
9 with is you're saying let's use these data for a best
10 estimate. I think what you're saying -- I think I may
11 agree with you.

12 MR. HENRY: It's time to go home.

13 DR. POWERS: That what you're saying is that
14 the staff merely needs to model the dynamics of the
15 clad because the data show that dynamics is of
16 overwhelming importance.

17 If it's there and it can oxidize, you not
18 only are not going to get any ruthenium release,
19 you're not going to get a decrepitation release. If
20 it's not there, then you've got another problem so you
21 have to mode the dynamics of the clad. That's the
22 best estimate you're talking about.

23 MR. HENRY: In essence, yeah.

24 DR. POWERS: Okay. I'll go along with that.
25 I mean, you can't argue with that.

1 DR. KRESS: I can't argue with that either.
2 Clad dynamics is a very tough problem.

3 DR. POWERS: It will attract your attention,
4 yeah. On the other hand --

5 DR. KRESS: I wouldn't mind doing some
6 experiments.

7 DR. POWERS: Well, on the other hand, I
8 think you may have the experimental base to do it
9 because they did a test in which they put enough
10 specific energy input into them to get the clad to
11 flow between the two oxide crust, one on the outside
12 and one between it and the fuel so that you would have
13 enough information to give yourself a criterion for
14 when the clad would flow down those things.

15 You probably would struggle with when the
16 clad would rupture and allow flow but, for an
17 unruptured case, I think the data exist.

18 MR. HENRY: A lot of things I think the clad
19 does that is shown on here and certainly the geometry
20 is influenced by the details of the pool, whether they
21 have boroflex or bural for PWR systems or nothing at
22 all. They just chose to control it with borax acid.
23 Obviously, for BWRs fuel assembly cans.

24 If you get to this issue of where the system
25 is partially drained down, it begins to look, except

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1 for the decay power and the fact of atmospheric
2 pressure the whole time, just like the kind of
3 analyses that have been done for large break LOCAs for
4 BWR systems.

5 You can go do that calculation to see just
6 how much oxidation you're going to get with that
7 because it's being limited by how much water you have
8 in there. You get in the range of 10 or 15 percent
9 and from then on it's just accumulating molten metal.
10 Obviously where that goes is down to the bottom of the
11 pool and after a long period of time you start having
12 concrete attack, etc.

13 But the cladding itself controls how the
14 material begins to relocate because the first part
15 that melts is actually inside the cladding because, as
16 Tom said, the zirc oxide could be brittle but unless
17 you give it some kind of a privation, the molten
18 material drains down in the inside of that ZrO₂ to
19 begin with and it starts dissolving UO₂.

20 All those things are relatively complicated
21 but what they tend to do is give you melt relocations
22 and start blocking everything off. Especially when it
23 finally breaks through the cladding there's a lot more
24 molten material to go out than just the cladding by
25 itself.

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1 All those things are part of what you have
2 to be concerned with if you go to detailed
3 representation. But I believe if you look through the
4 various things that have been done. Dana just
5 discussed the CODEX experiments. That's part of the
6 technical basis.

7 TMI is part of the technical basis. It's
8 not exactly what we're talking about here but it has
9 all the issues related to cladding dynamics and melt
10 relocation and even having the potential for some of
11 the fuel to be declad from the top part of the fuel
12 assemblies that's left on top of the debris.

13 These tests we just talked about certainly
14 you need to consider the fact that there can be a
15 small fraction of the material left on top of the
16 debris and that should also be assessed in terms of
17 it's temperature because it by itself is hard for it
18 to get very hot because it is cooling.

19 Unless the debris bed gets real deep it's
20 cooling by radiation. That has a very long -- if you
21 keep temperatures below 1,000 Kelvin it takes quite
22 awhile to release the material. Those are only
23 recommendations for expanding the technical basis.

24 DR. POWERS: Would you go over that debris
25 bed a bit for me? I just didn't follow you. I mean,

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1 debris beds get hot pretty easily actually.

2 MR. HENRY: Debris beds can get hot pretty
3 easily depending upon their decay power. Of course,
4 we are dealing with things that are fairly small here.

5 If this material that collapses down and
6 accumulates a continuous mass and it's having a hard
7 time getting energy out of it, which it will, then all
8 the particulates sitting on top isn't receiving much
9 from below and it's only going to reach a temperature
10 that it by itself is able to power.

11 You have circulation through that bed and
12 you have radiation off the surface. An example, 10
13 percent of the material is going to cool very
14 effectively in the range of about 950K.

15 You can translate that back to what the rate
16 of release is that you again get from experiments that
17 have unclad fuel. That's a very slow release rate
18 given from ruthenium exposed to the air.

19 DR. POWERS: 1,000 degrees?

20 MR. HENRY: 950K.

21 DR. POWERS: You might want to go back and
22 look at the Oak Ridge disk. Their top temperature in
23 their test series was 950, I believe, and they got
24 quantitative release.

25 MR. HENRY: You mean this Oak Ridge test

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1 here, VI-7?

2 DR. POWERS: No, no, the Lorentz tests that
3 were done back in the '60s. They ran a series of
4 tests that -- Tom, correct me if I'm wrong -- 450,
5 650, 750, 850, 950 and the 950 they got quantitative
6 release in less than 20 minutes.

7 DR. KRESS: That meets my recollection also.

8 DR. POWERS: They also got the tellurium and
9 a couple of other things were high at that
10 temperature. I can't remember what they were but
11 nothing is important except the ruthenium and the
12 decrepitation release.

13 Ah, that's a point. At that temperature
14 they did not get decrepitation release at that
15 temperature because the U308 that was forming was
16 centering almost as fast as it was spalling.

17 DR. KRESS: Decrepitation happened at lower
18 temperatures.

19 DR. POWERS: Yeah, they got decrepitation at
20 low temperatures but not at high temperatures.

21 DR. WALLIS: Dana, I think you should keep
22 all these results up your sleeve and have him do his
23 analysis and then see if it works.

24 DR. POWERS: He just has to do the Chernobyl
25 calculation.

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1 DR. WALLIS: I know but I'm just suggesting
2 that to verify or validate his approach.

3 DR. POWERS: I'm going to give him every
4 parameter in the world that he can adjust. He can
5 adjust the flow rate through it. He can adjust the
6 temperatures.

7 I mean, I'm giving you all kinds of fudge
8 factors here, Bob. Just calculate Chernobyl for me.

9 MR. HENRY: I'll be happy to go back and
10 look at Lorentz' data. I based mine on the data that
11 the Canadian people did. That's all why we should
12 have some kind of peer review here to make sure that
13 not only is the database known but used in a
14 consistent manner.

15 In conclusion, the evaluations for the cask
16 drop event we think should incorporate this database
17 which is significant, which is full scale. It also
18 takes advantage of things that are done with very high
19 specific loadings.

20 We think that if you use that quantitative
21 approach, in essence that one is virtually impossible
22 or zero, George, because, again, that's why you have
23 a peer review, to make sure you get a cross section of
24 opinions.

25 I think you could take that one off of the

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1 list. We think the risk that is shown in here should
2 also represent a third curve -- should include a third
3 curve to give some idea of what we think the best
4 estimate is because we did these experiments.

5 While we may not have the kind of database
6 there we have with other parts of the analytical
7 spectrum, it sure would be nice to give some
8 perspective in the integral sense what this really
9 means.

10 Lastly, we think that things like this, that
11 peer review cuts across the board of both industry and
12 academia as well as the regulator is essential because
13 then we make sure that whatever the technical basis is
14 gets surfaced, gets at least reported so people know
15 what is sitting out there they can use to make some of
16 these decisions.

17 DR. KRESS: Let me ask you about the second
18 conclusion. The technical study did use a relatively
19 high ruthenium releases. Yet, they found the risk to
20 be acceptable. Why should they go any further if they
21 already have acceptable risk?

22 MR. HENRY: A lot of it is the perspective
23 that comes from it. Then there is also some
24 conclusions drawn in the back about what that means in
25 terms of issues related to EP and others as well and

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1 that comes from those studies where the risk is
2 acceptable.

3 DR. KRESS: Do you think there are other
4 considerations that might come into play eventually
5 because ruthenium has melted and land contamination
6 might be an issue if you use these bounding
7 calculations as opposed to best estimate?

8 MR. HENRY: I guess I'll beg on that one
9 until I knew exactly how they were going to be used in
10 the land contamination evaluations. I mean, it's hard
11 to compete with cesium in contamination.

12 DR. KRESS: I agree with you.

13 MR. HENRY: After five years ruthenium is
14 not much of an issue.

15 DR. KRESS: I agree.

16 MR. HENRY: Some of these pools are pretty
17 full.

18 DR. KRESS: If the risk was already found to
19 be acceptable, I was wondering if you thought maybe
20 when they get down to plant specific considerations
21 that they might find some that weren't acceptable by
22 the bounding calculations. Therefore, you might need
23 this best estimate as a basis for specific plants.

24 MR. HENRY: Lynette probably wants to say a
25 few things about this. I think the best estimate also

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1 gives you a good idea of where you need to focus your
2 attention in the future as you do come across other
3 issues. That's why we would really like to see it.

4 MS. HENDRICKS: I would like to pick up
5 there. By definition, if you have studies out on
6 different aspects of the plant operation and one is a
7 bounding estimate and the other is a best estimate, in
8 doing your plant PRAs and all this stuff how are you
9 going to treat this risk?

10 There's no basis other than best estimate or
11 mean estimate with the understanding of the
12 uncertainty to apply this in a risk informed
13 situation. I think you are going to be hard pressed
14 to do that. Yet, it's on the books as something that
15 is by its bounding nature implies a lot of risk. I
16 think the best estimate is really critical.

17 Another reason it's really critical is
18 because, and this was actually captured in the study,
19 when you say the risk is acceptable, they actually
20 went so far as to say, "We're not thinking about
21 saying that you need a containment for the spent fuel
22 pool."

23 That is different than asking those
24 questions about do you need EP financial protection.
25 Those questions, I think, you may need to look more to

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1 what is a negligible risk. For that, again, you need
2 a best estimate. That is the tool the commission
3 needs.

4 Ultimately it will be a policy call because
5 there is no magic number associated with financial
6 protection or EP. But certainly a best estimate would
7 allow them in a more absolute sense to say, "Okay, we
8 have EP over here for the plant and should we
9 determine on the basis if this risk is somewhat
10 negligible compared to this that we can justify
11 terminating those requirements."

12 Although the staff mentioned the stuff is
13 intended to be broader than just looking at those
14 requirements, the gist of the study was to address
15 three ongoing rule makings for these requirements.
16 The reason those rule makings are predominate is this
17 is the only opportunity to save money or conversely to
18 spend a lot of money unnecessarily in the
19 decommissioning phase.

20 DR. KRESS: When people say best estimate,
21 I'm never quite sure what they mean. I'm wondering if
22 you could tell me what you mean by best estimate?

23 MS. HENDRICKS: What the safety goal says is
24 you use mean values with a clear understanding of what
25 the uncertainty is.

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1 DR. KRESS: So a best estimate is a full
2 distribution because in order to get a mean you have
3 to have a distribution. Sounds like a tough job to
4 get a best estimate for this particular issue.

5 DR. WALLIS: Could we put this in some
6 perspective? We heard from the staff that no further
7 physical chemical studies are needed because the risk
8 is so low anyway. What's to be gained by learning
9 anymore about this phenomena?

10 MS. HENDRICKS: I think what's to be gained
11 is the commission has to make harder decisions. You
12 know, is it safe enough compared to the safety goals.

13 Obviously it is but the harder decisions to
14 make are do you need the extra protection, expensive
15 protection, very expensive especially if it goes on
16 forever because you can't determine a configuration at
17 which point you can determine a heat removal that
18 would imply that you don't need to worry anymore.

19 Twenty years or so of EP and financial
20 protection are going to be grossly expensive compared
21 to how we look at funding for decommissioning today.

22 DR. WALLIS: So you're worried about the EP
23 cost and sort of custodial cost. You would like to
24 just leave the thing after a while?

25 MS. HENDRICKS: You don't leave it.

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1 DR. WALLIS: Close it up or something.

2 MS. HENDRICKS: You don't leave it. There
3 are still people there.

4 DR. WALLIS: Not so many people.

5 MS. HENDRICKS: Stuff to be done. We have
6 an operator on site 24 hours a day with nothing to do
7 but focus on this pool.

8 DR. WALLIS: It must be the most boring job
9 in the world.

10 MS. HENDRICKS: Well, it may be boring.

11 DR. KRESS: But you don't feel you could
12 make those reductions and requirements on the basis of
13 risk alone?

14 MS. HENDRICKS: Not with the bounding
15 estimate. Another thing that concerns me about the
16 bounding nature of the study was we talked about what
17 will it mean. Okay, it's bounding because we just
18 couldn't do much better with all the conservatism
19 stacked up on a generic basis, but we imply that we
20 can do more on a plant specific basis.

21 But if it's done within the constraints of
22 the study, you're not going to get a different answer.
23 You're going to have it driven by seismic. You're not
24 going to be able to predict the configuration and you
25 are going to assume maybe avaticia conditions. I

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1 don't see much relief going from this bounding to a
2 sight specific, unless I'm misunderstanding the way
3 the study is put together.

4 Do we have time to talk a little about
5 seismic?

6 CHAIRMAN APOSTOLAKIS: There's 10 minutes
7 left.

8 DR. KRESS: Ten minutes.

9 MS. HENDRICKS: Given the depth of my
10 understanding of seismicity, I don't think we have to
11 worry about this going too long.

12 This is a curve that we shared at the
13 commission briefing that shows the distribution of the
14 risk by peak ground acceleration. I'm going to flip
15 a couple up here quickly just to show that --

16 CHAIRMAN APOSTOLAKIS: What is this figure
17 now? Let's understand the figure. If you put it up
18 there, you have to understand it. You have the peak
19 ground acceleration on the horizontal axis. The
20 percent contribution. What does that mean?

21 MS. HENDRICKS: The percent contribution at
22 the different seismic bands of damage to the pool.
23 This represents convuling the hazard of the pool
24 fracturing on top of the seismic hazard on a plant
25 specific basis.

1 CHAIRMAN APOSTOLAKIS: This is conditional
2 on this peak ground acceleration so given that I have,
3 say, .9G, right? Or .8G, I go up and I see that there
4 is the probability of .2 of causing damage. That's
5 what that means.

6 MS. HENDRICKS: I don't know that it can be
7 interpreted that way. It's a percent of the total
8 contribution. It's more a way to show a distribution.
9 What percent of the seismic failure.

10 CHAIRMAN APOSTOLAKIS: It says condition to
11 spent fuel pool structure or failure probability.
12 That's what it says.

13 DR. WALLIS: There must be a frequency in
14 there somewhere because you would expect 2G to be more
15 effective than 1G.

16 MS. HENDRICKS: Well, the probability goes
17 down.

18 DR. WALLIS: That's right so probability is
19 in this, too.

20 MS. HENDRICKS: Right. Yeah. When you
21 convolve the risk on top of the seismic hazard.

22 CHAIRMAN APOSTOLAKIS: On the horizontal axis
23 you count accelerations.

24 MS. HENDRICKS: Right.

25 CHAIRMAN APOSTOLAKIS: Not frequency. This

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1 is .8G, for example. If I go to the left, this is a
2 percent contribution to failure of the pool. That's
3 what it says.

4 MS. HENDRICKS: Right.

5 CHAIRMAN APOSTOLAKIS: So 20 percent of the
6 failures are due to .8G. Is that what it means? Then
7 I have to multiply by the frequency of .8G to get the
8 absolute frequency of the damage. That's the way I
9 understand it.

10 MS. HENDRICKS: No, that's already in there.
11 You took the hazard curve where you've already
12 convulved the risk of failure on top of the
13 probability of the event as well as the magnitude of
14 the event. This is just taking that curve and
15 parceling it out to show you the distribution.

16 I think Gary Hollihan's comment on this was
17 it's not surprising. You have a very robust structure
18 that even though the frequency of the seismic events
19 are larger, the probability of failure is small.

20 CHAIRMAN APOSTOLAKIS: So let me rephrase it
21 then to make it consistent with what you said. .8G
22 and I go up and find .2. .2 times 1.4 to the -6 will
23 give me the failure frequency of the pool that's
24 caused by a .8G acceleration. It's unconditional,
25 right? It's unconditional. It says it includes the

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1 frequency of .8G. Who came up with this diagram?

2 MS. HENDRICKS: Our EPRI seismic experts
3 did. I was looking for a way. We all say --

4 CHAIRMAN APOSTOLAKIS: A way to confuse us.

5 MS. HENDRICKS: No, no, no. We all agree
6 it's all driven by uncertainty and that we just go on
7 and use the curve. I think this will help you
8 understand what it means when you use that curve.
9 I'll show you the other soon or you can just flip.

10 DR. SHACK: this is basically telling us
11 that most of the risk is coming from this far tail
12 with the big acceleration.

13 MS. HENDRICKS: Right. The median is in
14 excess of -- the median is at 1G so more than half
15 this risk that we're applying. The question obviously
16 is does this make sense.

17 CHAIRMAN APOSTOLAKIS: It's the same with
18 reactors. I mean, the seismic contribution comes from
19 accelerations of three or four times a safe shutdown
20 earthquake which is what you're saying here. The safe
21 shutdown earthquake is .15G and you're stuck seeing
22 the significant import from .5 and so on. It's
23 consistent I think.

24 MS. HENDRICKS: It's consistent to a point.
25 It's consistent to a point. What makes this different

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1 and in some cases worse is just to look at damage for
2 this very rigorous structure we extended the curves.
3 The Livermore and EPRI curves that we use for plants
4 stop at a lower return frequency. They stop at, I
5 think, 10,000 years. We specifically took this out to
6 a million years which is going to influence the
7 results.

8 The rest of the curves, as you can see, you
9 get the same basis distribution and the same basic
10 conclusions which are that --

11 DR. WALLIS: This structural failure
12 problem, doesn't this thing leak before it breaks?

13 MS. HENDRICKS: This is looking for a
14 catastrophic failure because leaks you can replace.
15 Then you get your human error.

16 DR. WALLIS: Doesn't it leak? Even after an
17 earthquake it's full of rebar. Doesn't it just leak
18 in a few places? It doesn't just fall apart.

19 DR. SHACK: I think it's a question of
20 whether it leaks or it leaks like a sieve.

21 DR. WALLIS: That's got to come into the
22 analysis.

23 CHAIRMAN APOSTOLAKIS: I think we understand
24 it now.

25 MS. HENDRICKS: Okay. So the point is the

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1 mean is about 1G. At this level between about .5 and
2 .7 if you go to the next curve is where you pull off
3 at least for surry. We'll go surry to surry numbers.

4 What this curve shows is that at the 50
5 percentile to get into this range where you get into
6 the real risk contribution between here and here, the
7 frequency is about E to the -6.

8 You are really reaching out to grab very
9 improbable events. You may do it in the context of
10 reactors but it isn't going to have the same effect.
11 I think you need to ask questions about how
12 appropriate it is to do here and potentially in other
13 areas of regulatory space where it's going to be the
14 sole contributor.

15 Are you going to drive all protection
16 requirements, all costs based on this seismic event?
17 It will be the issue for passive plant designs and it
18 could be the issue for the new plant design.

19 CHAIRMAN APOSTOLAKIS: I guess I don't
20 understand quite what the issue is.

21 MS. HENDRICKS: The issue is --

22 DR. KRESS: The issue seems to me is you
23 don't believe the seismic hazard risk.

24 CHAIRMAN APOSTOLAKIS: Why not?

25 DR. KRESS: I don't know. I mean, that's

1 what --

2 CHAIRMAN APOSTOLAKIS: The issue is you
3 don't want to use it.

4 DR. POWERS: I would say that she absolutely
5 believes the seismic hazard risk studies. She thinks
6 that they tell you that this is something beyond the
7 pale.

8 MS. HENDRICKS: Exactly.

9 DR. POWERS: I understand. Can I ask you a
10 question about your slide?

11 MS. HENDRICKS: Sure.

12 DR. POWERS: Which really has nothing to do
13 at all with spent fuel pools.

14 MS. HENDRICKS: No, it has everything to do
15 with spent fuel pools.

16 DR. POWERS: The figure does but the
17 question doesn't.

18 MS. HENDRICKS: Oh, right.

19 DR. POWERS: The question is you plotted the
20 15th and 85th percentiles. About the mean, why those
21 particular ones? There's nothing devious about the
22 question.

23 MS. HENDRICKS: Right. I don't know. It
24 wasn't the 5th and 95th.

25 DR. POWERS: Those are just numbers you had.

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1 MS. HENDRICKS: That's what was provided.

2 DR. POWERS: Nothing devious.

3 MS. HENDRICKS: No. I know you're not
4 devious.

5 CHAIRMAN APOSTOLAKIS: Aren't you saying
6 though --

7 MS. HENDRICKS: I would never say that.

8 CHAIRMAN APOSTOLAKIS: Is this the -- I
9 mean, are you expressing different words the old
10 argument that if I have designed a thing against .15G
11 SSE, and I see that my damage occurs four times that,
12 three times high earthquake, I shouldn't just do
13 anything and just say it's good enough.

14 Is that what really you're saying which is
15 the argument that why to use a PRA. PRA doesn't
16 recognize this design basis thing and just goes all
17 the way until it fails the thing and what really
18 matters is the frequency. Is that the same argument
19 you're bringing up?

20 MS. HENDRICKS: It's real close but I think
21 what I'm trying to say is part of doing PRAs is
22 understanding the uncertainty when you understand that
23 the uncertainty is really completely driving you.

24 Another thing I wanted to point out on this
25 curve, and I don't have it marked, but if you look at

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1 the delta or the decrease in probability of occurrence
2 between .1 and .3 because the air bands are fairly
3 narrow, you get a factor of 10 decrease.

4 Between .3 and .6 because your bands are
5 diverging, you have to go that much further to get a
6 factor of 10. And to go from .6 to 1 you don't get a
7 factor of 10. You get a factor of 5 decrease in the
8 probability of exceedence.

9 What that tells you is even if you were to
10 say it makes sense to design at these higher levels,
11 you wouldn't even get credit for it in the
12 uncertainty. It makes you ask what basis is that for
13 doing what this agency is supposed to be doing which
14 is determining what is appropriate to apply in terms
15 of additional requirements.

16 If you're looking at a curve that wouldn't
17 give you any credit for extreme redesign of your
18 plant, does that really seem like a logical basis to
19 regulate with?

20 CHAIRMAN APOSTOLAKIS: Well, I don't
21 understand this credit business. I mean, the
22 frequency of occurrence of this acceleration would not
23 go down significantly but you would certainly get a
24 hell of a lot of credit because you have built a
25 stronger facility. This is not the probability of

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1 failure. It's just the frequency of exceedence of the
2 acceleration which is modern nature. I think we are
3 getting into a debate here.

4 MS. HENDRICKS: Yeah. Yeah. I think --

5 CHAIRMAN APOSTOLAKIS: Your point that we
6 should really understand better the details are going
7 to the analysis is well taken. Beyond that maybe we
8 shouldn't debate it more.

9 MS. HENDRICKS: Okay. Well, let me kind of
10 close out here.

11 CHAIRMAN APOSTOLAKIS: Okay.

12 MS. HENDRICKS: I think the way the study
13 progressed is nobody completely ignored this
14 phenomena. They came up with a number for the
15 seismic. They said seismic predominates. Very, very
16 conservatively is 3 or 2E to the -6.

17 Everybody recognized that was highly
18 conservative because of the conservatism in this and
19 the conservatism in the furgility estimates. They
20 even went so far, the experts, to say the risk is
21 acceptable and it's much lower probably than E to the
22 -6.

23 I think it begs a fundamental question if it
24 gets that close to negligible, does it make sense from
25 a public communication point to go ahead and do the

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1 math. You know, risk times consequence and show these
2 health effects.

3 I mean, we say that negligible probability
4 is in the E to the -7 range and we are probably very
5 close and we have qualifiers and we have the ability
6 to show significant capacity beyond earthquakes that
7 would even be expected on the east coast.

8 I mean, it seems -- and what I'm leading to
9 is the question has come up in discussions with the
10 staff and it came up in discussions with the
11 commission of, well, then should we go back since we
12 have this process and resolve the differences between
13 the EPRI and the Livermore curves.

14 I think there is even a more fundamental
15 question here of how to treat seismic risk than just
16 can we bring the experts together and get them to
17 agree.

18 CHAIRMAN APOSTOLAKIS: The difference
19 between Livermore and EPRI is not that great anymore.
20 I understand Livermore updated their curves in 1993.

21 MS. HENDRICKS: But it makes for good
22 agreement in areas where you expect earthquakes but
23 the tails diverge significantly. For the spent fuel
24 pool study it made a factor of 10 difference which is
25 only a factor of 3 if you look at cask drop but if you

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1 take cask drop out, you're back to --

2 DR. SHACK: And your last slide says we
3 should just truncate these suckers.

4 MS. HENDRICKS: I think there should be some
5 consideration of truncating. There should also be
6 consideration to come up with analysis which looks
7 more deterministic.

8 DR. POWERS: If my objective is solely to
9 look at the bottom line risk in these things, I think
10 I agree with you since you're trying to communicate to
11 people. Taking outlandishly high numbers and then
12 claiming very low probabilities to them is probably
13 not really communicating. I mean, taking an
14 infinitesimal probability with a big high spike
15 doesn't communicate.

16 If, on the other hand, I was doing this to
17 say, now, what kinds of things should I be doing and
18 what things have risk achievement worth and risk
19 reduction worth, then don't I want to go ahead and do
20 this?

21 MS. HENDRICKS: You may want to do it for
22 that reason. I think NUREG 1150 did it for large
23 seismic events. They looked at core damage frequency
24 but they showed some restraint and didn't go ahead and
25 do the multiplication to show these consequences. The

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1 maddening thing about --

2 DR. POWERS: It was a lack of money. I know
3 those guys.

4 MS. HENDRICKS: They're cheap.

5 DR. POWERS: No, their sponsors are cheap.
6 They're profligate.

7 CHAIRMAN APOSTOLAKIS: Who is communicating
8 with whom here when we say communication?

9 MS. HENDRICKS: With the public. With the
10 public. When you go --

11 CHAIRMAN APOSTOLAKIS: This agency is
12 supposed to be doing good technical work so, I mean,
13 they have to communicate it to the public. I don't
14 know what else can they do.

15 MS. HENDRICKS: I think it's inflammatory to
16 take events of very, very low probability and multiply
17 times consequences.

18 DR. KRESS: I don't understand that. That's
19 what risk is, frequency times consequence.

20 DR. POWERS: Yeah, Tom, but let's be
21 practical. I'm very sympathetic to this point of
22 view. If you come out and tell me there is a
23 probability that 100,000 people are going to die in
24 Russia as a result of the Chernobyl accident, that
25 gets the headlines.

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1 Now, the fact that the probability is 10 to
2 the -8 somehow doesn't ever make the headlines or
3 anybody's reading. If it was just the headlines, I
4 would probably say that's not the only thing the
5 public --

6 DR. KRESS: But I don't want to cook the
7 numbers.

8 DR. POWERS: I think she has a good sound
9 point here depending on what you're going to do. If
10 what you're going to do is look at the risk for this
11 pool, then I think truncation has its merits.

12 If I'm going to do it to then derive
13 something from the risks based on differentiating
14 them, risk achievement and risk reduction worth,
15 should I have a guy come by and check the pool once a
16 week, once a month, once a year, that kind of
17 question, then I think you shouldn't truncate it.

18 CHAIRMAN APOSTOLAKIS: Anyway, I wouldn't
19 want the staff to come here and tell us we did this
20 calculation but it would scare the public so we're not
21 going to tell you about it. I don't think that's
22 where you're going but --

23 MS. HENDRICKS: At some point, though, we do
24 that.

25 CHAIRMAN APOSTOLAKIS: That's nature.

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1 MS. HENDRICKS: We don't do the
2 multiplication. I mean, your number that you gave at
3 the commission briefing, Dana, was 10 to the -7.
4 Maybe there's a point where you don't do the
5 multiplication, not that you deny the risk.

6 DR. POWERS: I think you've got good sound
7 reason to pick that number because what did we do with
8 the VANRs? (A) We don't put them in the PRAs and the
9 reason we don't is 10 to the -7. Hence, we don't even
10 put them in.

11 This "I don't want to scare the public" sort
12 of argument has merits to it. I understand that sort
13 of thing. I understand the purists. What I worry
14 about is when we say there's a probability of 100,000
15 people dying in Chernobyl -- or the Ukraine because of
16 the accident at Chernobyl, even though that's 10 to
17 the -8 probability, it does provoke people to do
18 things.

19 We get massive studies of radiation effects
20 that can't possibly ever yield a useful number because
21 of the background chance of deaths but they are in
22 response to these kind of flamboyant numbers. I
23 appreciate the point that's being made.

24 MS. HENDRICKS: I think, too, to look at it
25 from the reverse perspective, it's inflammatory, one,

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1 but then also I think it sets up an expectation of a
2 level of protection that's unreasonable. I mean, are
3 you telling the public that they should expect the
4 next facilities to be built and to withstand --

5 CHAIRMAN APOSTOLAKIS: No. I don't.

6 DR. WALLIS: It's like asteroid collisions.

7 MS. HENDRICKS: Exactly. Everybody knows
8 about the big asteroid in the back of their mind but
9 if we did the numbers and showed how many people were
10 going to die, you may end up in a situation where
11 people would demand research into how to protect us
12 from the asteroid.

13 DR. WALLIS: And it will happen twice in the
14 age of the earth.

15 MS. HENDRICKS: As a result, money would be
16 taken away from our real risks in things that we can
17 more readily mitigate.

18 CHAIRMAN APOSTOLAKIS: This is a much bigger
19 issue than can be resolved in the next few minutes.
20 Are there any other comments you would like to make?

21 MS. HENDRICKS: We always end up on the same
22 note. Peer review. Maybe we could do some sort of a
23 peer review on the seismic. I'm not sure it's the
24 seismic experts because I don't think these curves
25 will ever change but maybe they shouldn't but peer

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1 review about the appropriate use.

2 DR. POWERS: You know, I guess I realize you
3 are kind of insulting the committee. We were asked to
4 do a technical review and apparently what we did was
5 inadequate, I guess, in your mind, but we are not
6 peers. I mean, some of us think -- at least one of us
7 thinks he's a lord.

8 CHAIRMAN APOSTOLAKIS: I don't think we
9 should get into that. Any other comments?

10 DR. POWERS: How much more peer review do
11 you want?

12 CHAIRMAN APOSTOLAKIS: The commission has a
13 history of establishing external peer review. When
14 they did the 1150 review they did not intend to insult
15 the ACRS so I don't know why -- in this particular
16 case if they want to have a peer review, they want to
17 have a peer review. I mean, if they weren't happy
18 with an ACRS review, they wouldn't probably ask for
19 it.

20 MS. HENDRICKS: Nor does ACRS have the
21 resources to look at -- I mean, this study portrayed
22 many questions that would take a lot of resources to
23 complete.

24 CHAIRMAN APOSTOLAKIS: Any other comments
25 from the staff? The public? Thank you very much.

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1 MS. HENDRICKS: Thank you.

2 CHAIRMAN APOSTOLAKIS: We'll recess until
3 2:45.

4 (Whereupon, at 2:26 p.m. off the record
5 until 2:46 p.m.).

6 CHAIRMAN APOSTOLAKIS: The next subject is
7 Management Directive 6.4 Associated with the Revised
8 Generic Issue Process. Dr. Kress again.

9 DR. KRESS: I'm busy today.

10 CHAIRMAN APOSTOLAKIS: Boy. Go ahead.

11 DR. KRESS: Well, just to remind the
12 committee, the ACRS has had misgivings about the whole
13 generic issue process for some time and had expressed
14 it in a series of letters. The staff decided to look
15 at the GSI process and see how to make it better, I
16 guess.

17 They came to us back in '99 with the revised
18 GSI process. As far as I can tell from reading your
19 letters and my recollection is we liked what we heard.
20 It sounded like a comprehensive way to do it and an
21 improved way. I think what we asked was could they go
22 out and do a pilot assessment of it and tell us how it
23 worked in practice.

24 I think that's what they did and today I
25 think we're supposed to hear about the results of that

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1 pilot assessment. I'll turn it over to Harold
2 VanderMolen, I guess.

3 MR. VANDERMOLEN: Thank you, Dr. Kress. My
4 name is Harold Vandermolen. I have sometimes the
5 dubious distinction of being manager of the generic
6 issue program. On my left is Mr. Ronald Lloyd who is
7 our person in charge of management directive 6.4.

8 Yes, we're going to tell you about our
9 experiences with the trial application of the draft
10 management directive.

11 MR. LLOYD: Our first slide kind of recaps
12 some of the things that Dr. Kress has alluded to. We
13 initially had a draft version of 6.4 that was issued
14 back in early '99. We had an ACRS presentation at
15 that time talking about what was in that particular
16 document.

17 We did go through it by the end of July as
18 is shown on the slide. We actually produced an entire
19 version of management directive 6.4. There was a very
20 minor change to it that was proposed by OGC to add in
21 some lawyerese to the document on October 21 of '99.
22 Then we are here today, March 1, to provide some
23 lessons learned on what we actually found and
24 discovered as we tried this out on some reactor issues
25 and also some material issues.

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1 We also have a tentative schedule that will
2 be on another slide. The purpose of our being here at
3 this time is to seek approval to go through and update
4 that management directive based on the lessons learned
5 we have to date.

6 DR. KRESS: Are you looking for a letter
7 from us then?

8 MR. LLOYD: We would be looking for a letter
9 probably at your convenience in the April/May time
10 period to tell us to proceed.

11 DR. KRESS: Okay.

12 MR. LLOYD: We'll go over that schedule
13 which is on a slide further back in the presentation.

14 Our next slide, please.

15 The process that existed earlier was
16 referred to as RES office letter No. 7. It basically
17 had three different steps in it: Identification which
18 was basically what is the issues. It had a
19 prioritization phase where we would go through and do
20 an assessment, a PRA type assessment.

21 We would then categorize so there's a high,
22 medium, low or a drop situation. Then comes the
23 resolution phase. I know this caused some problems in
24 the past with ACRS, you know, what does resolution
25 mean, what does resolve mean, and so on.

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1 Beyond coming up with basically an available
2 solution which was the resolution phase of the old
3 procedure, nothing was really procedurized which was
4 one of the concerns, I believe, of several people.

5 The draft management directive, as you can
6 see on the left side of the table, currently has eight
7 stages to it which takes it through from the very
8 beginning to complete close out which is
9 proceduralized to verify the corrective actions have
10 been taken by licensees on some sort of audit basis
11 and a closeout inspection that would have to be
12 documented to do that with several steps in between.
13 To date we have experience of going through stage one,
14 two, and three of the management directive.

15 Next slide, please.

16 The next one here shows the issues that we
17 actually tried it out on. We had six candidate
18 generic issues, three reactor, and three materials
19 issues. The material issues we'll go through kind of
20 briefly now and then we'll talk about the reactor ones
21 on subsequent slides.

22 The material issues were basically all
23 identified in the October 2000 time period. As you
24 can see by the current status on the block to the
25 right of that, these issues were received by the panel

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1 and an in depth discussion as to what the issue really
2 was and its risk significance and what should be done.
3 We are subsequently dropped from any further review by
4 the generic issue program in January and then again in
5 February of 2001.

6 They were basically dropped because of a
7 couple of reasons. They ended up being isolated
8 cases, i.e., not generic, where their risk
9 significance was lower, or there was already existing
10 regulatory guidance that was sufficient to maintain
11 whatever needed to be maintained as far as inspections
12 and verification that things were being done
13 appropriately.

14 MR. LEITCH: Were these dropped at step 2,
15 that is, the initial screening level?

16 MR. LLOYD: Yes. That's correct.

17 Next slide.

18 MR. VANDERMOLEN: Now, we are going to speak
19 about our experience with each of these issues in a
20 moment. In addition to those six, we felt that we
21 should have one issue that we sent to the old process
22 just for comparison purposes for this use, generic
23 issue 185 which had just come in.

24 The old process has been in place for about
25 20 years now and it has had over 800 issues processed

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1 through it. Although it's been modified a few times,
2 it has essentially been unchanged in all of that time.

3 It was one of the first uses of
4 probabilistic risk techniques in agency decision
5 making. We did not feel that we could really evaluate
6 experience with the new process unless we had at least
7 one that we sent through the process with some
8 examination and oversight to be able to compare the
9 two.

10 Now, getting into the specific issues, we'll
11 start out with 186. Ron.

12 MR. LLOYD: 186 was one that I was
13 personally involved in as far as gathering data and
14 information. This was one that was proposed by NRR
15 and they had worked it for some period of time. They
16 figured that we needed -- they needed to have
17 additional technical basis for making decisions so
18 they wrote a letter and forwarded it over to research.

19 Then it came in a time period when we were
20 just starting to work with management objective 6.4 so
21 it got picked up under the new procedure. The panel
22 met successfully. We had a very good panel that did
23 get together. We had a couple of different meetings
24 with the panel to discuss additional information.
25 There are a few lessons learned out of that.

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1 Initially when the panel looked at all the
2 information and the data it was classified as a
3 compliance issue and the recommendation would be that
4 the issue should be dropped from any further
5 processing through the generic issue program.

6 At that NRR requested that we actually do a
7 risk significance and gather some operating data that
8 they could use. It was decided we would continue on
9 with the generic issue program and continue to process
10 that issue.

11 After which time NRR then complained so much
12 that too much time was being burnt up by their people
13 coming to the panel meetings and so on and they
14 actually didn't budget sufficient amount of time in
15 their own budget for the entire year. Harold will
16 talk about that a little bit later. These were some
17 of the lessons learned that we came up with.

18 We actually ended up going out and visiting
19 eight different facilities of different design types
20 to get a good broad spectrum of what would be out
21 there from a risk perspective. We hit all the various
22 kinds of BWRs with different containment type designs.
23 We also did different PWR designs by different NSSS
24 ventures and so on.

25 DR. KRESS: Is there a record of drops that

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1 end up in the LERs or somewhere?

2 MR. LLOYD: Yeah. What we did was we went
3 through new docs and went back to the beginning of
4 time and looked at all the different drops or problems
5 that had been recorded some place, either by vendors
6 themselves, crane vendors, licensees, inspection
7 reports, where we could find them.

8 Then we went out and actually gathered data
9 going back to the time that NUREG 0612 was generated
10 which was 1980 which then required licensees to kind
11 of beef up their crane program and come up with a lot
12 of different sorts of procedural requirements and
13 training requirements, electrical interlocks and so on
14 to make them more reliable, I would guess.

15 We got that data and we extrapolated to the
16 other different kind of design types and looked at the
17 number of refueling outages that they had had and came
18 up with a number of problems and also the number of
19 lists that you had. We had a frequency of failure to
20 start.

21 We've got some good data on that. That has
22 been put into a couple of different databases and we
23 expect to turn out a report on this probably within
24 the next month or so. That's 186.

25 187 is one that Harold will cover.

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1 MR. VANDERMOLEN: Yes, 187 is not as far
2 along as 186. 186 has actually gone through initial
3 screening and is into technical screening, the third
4 stage of the process. The next two are newer and
5 haven't gotten quite as far. 187 is nearing the end
6 of initial screening.

7 This is one on cesium concentration. All of
8 these are interesting in their own light technically
9 but I would like to concentrate on the experience we
10 had with the procedure.

11 We learned all the lessons that we learned
12 in 186 and a few more. Difficulty encountered in
13 arranging panel meetings. Well, what did we learn?
14 What we learned was that the panel members that you
15 really want are people who are very much in demand.
16 It's not always easy to get their time. They are
17 often already busy and booked up.

18 This contrast would be management directives
19 requirement that we try and get initial screening done
20 in 30 days. This particular one, one of the
21 principals was called out to testify at an ASOB
22 meeting right in the middle of that period and we were
23 pretty well stuck. Not an impossible problem but it
24 did mean a delay.

25 We also learned that it is very wise to give

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1 guidance early in the process on how the panel is
2 going to decide things. The management directive is
3 silent on this but the question is should a panel come
4 to its decision by unanimous consensus. Should it be
5 by a majority vote? If you do go by majority vote,
6 you have to talk about whether or not you are going to
7 allow descending opinions to be written.

8 These are not new questions for this
9 committee I'm sure. But in this particular case the
10 panel decided right at the beginning that it would try
11 and achieve the full consensus. Then what we
12 discovered was that even if everyone agrees on the
13 conclusion, it is possible to disagree on exactly how
14 you are going to get there. We are still resolving
15 this one, although we are pretty close to getting it
16 out.

17 DR. KRESS: Suppose you had -- how many
18 members are generally on the panel?

19 MR. VANDERMOLEN: Anywhere from six to --
20 what was the biggest one we had?

21 MR. LLOYD: Five to seven or eight.
22 Something like that.

23 DR. KRESS: Suppose you had four of them
24 that said drop the issue and two that said go on with
25 it? Do you have a binary system that says pick the

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1 highest, the most problematic one? That is, send it
2 on and not drop it?

3 MR. VANDERMOLEN: Well, we really don't have
4 an answer to that one yet. This is one of the things
5 we have to resolve. There is always the oath that is
6 administered to a jury here in Montgomery County.

7 If any of you live in this area, you may run
8 into it, where the jury is sworn by the judge to keep
9 the jury with neither meat nor drink until a decision
10 is rendered. Fortunately, we're not too serious about
11 it. Although, I am tempted on some days, I don't mind
12 telling you.

13 We'll talk more about this when we come to
14 our recommendations.

15 Next slide, generic issue 188, also in the
16 initial screen stage. This is one on resonance
17 vibrations of steam generator tubes following a main
18 steam line break event.

19 Again, this is a very complex issue
20 involving inspection of disciplines that wound up with
21 a somewhat larger panel still. We had all the same
22 difficulties of getting an expert panel together.
23 Then when we got the panel together, the staff member
24 who raised the issue was unavailable because he was
25 involved in still other activities, some of them

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1 involving the ACRS.

2 DR. KRESS: Is the issue that you might fail
3 the steam generator tubes by these vibrations?

4 MR. VANDERMOLEN: Yes. That's exactly it.
5 Strongly related to similar issues that I know you've
6 been considering.

7 DR. KRESS: Yes.

8 MR. VANDERMOLEN: Also, the principal person
9 that we wanted to talk to wound up having some
10 significant medical problems at the time and was
11 unavailable. We have to allow for these things.

12 One thing I should point out is when we
13 started this issue and, again, I think people around
14 here will be sympathetic to this, it is amazing how
15 much briefing material you sometimes have to provide
16 to committee members. This was a stack that was about
17 six inches high.

18 What did we learn from the process?
19 Obviously the panel preparation is not easy. Also we
20 learned in the discussion that it was not easy to tie
21 down the scope of the issue.

22 In any of these generic issues you have to
23 at a very early stage just decide where the scope is
24 and not change it once you start because otherwise you
25 will never come to consensus. We went through all of

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1 this on this issue.

2 Having said that, I want to make a few
3 overall comments. When I say that there was
4 difficulty in panel preparation, I did not mean that
5 there was anything inadequate about the technical
6 discussion of the panel.

7 What this translated into was that people
8 had to spend a lot of time preparing for the meeting.
9 I have to say having been on these panels and feeling
10 a little skeptical when the whole thing started, the
11 technical discussion that I observed was of extremely
12 high quality.

13 I've been here for a while and I've been on
14 a lot of committees and panels and things like that
15 and I've observed many more. These were very
16 professional. There was a lot of good discussion not
17 only at the meetings but in between meetings as
18 members would discover new facts or documents that
19 were relevant.

20 They were sharing them with the entire panel
21 by e-mail and so forth and people arrived at every
22 meeting well prepared having read all the material.
23 It was quite a good focused discussion.

24 DR. KRESS: Who selects these panels?

25 MR. VANDERMOLLEN: We recommend panel members

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1 to our management but ultimately the office director
2 sings a memo after negotiating appropriately and
3 actually nominating the members.

4 DR. KRESS: You picked the panel and their
5 candidates by their expertise related to a specific --

6 MR. LLOYD: It could be based on their
7 expertise and also be different depending on whether
8 it was a reactor issue or a materials issue, whether
9 Research would make that move or whether NMSS would
10 make that move.

11 DR. KRESS: When you decide I would like to
12 have this guy here, do you check with him to see if
13 he's willing to serve?

14 MR. VANDERMOLEN: Yes. And we have to check
15 with his boss, too. The management sometimes has
16 strong opinions about this.

17 I should also say that we had some
18 difficulty in this issue and some of the others. Once
19 the people got going they were all set to go ahead and
20 charge in and try and solve the issue. We had to keep
21 it just on the purposes of the initial screening.

22 Next slide, Ron.

23 We also, as we mentioned, had an experience
24 with the generic issue we processed under the old
25 system. This is generic issue 185, control of

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1 recuracality following small-break LOCAs and PWRs.
2 Again, this is a rather complex technical issue
3 requiring quite an in depth review.

4 Now, let me explain something here, the
5 difference in procedures which is why we were doing
6 this, of course. In the original procedure, the one
7 that we've been using for 20 years, there is no
8 initial screening panel. What happens is usually a
9 single analyst here sits down and investigates and
10 then writes up the issue doing a probabilistic
11 analysis and puts a package together describing all
12 the findings.

13 Then it goes out for a concurrence review.
14 Now, concurrence is nothing new to anyone here but
15 this is a little bit more than usual office
16 concurrence. It does go through our management, yes,
17 then the write up under the old procedure.

18 Parallel copies are sent. One copy is sent
19 to whatever person or group originated the issue.
20 This person may not agree with the analysis and
21 usually gives it a pretty thorough looking over.
22 Another copy goes to whoever, be it a single person or
23 a group, usually group, is going to have to work to
24 resolve the issue. That person may have very
25 different opinions from the first one.

1 Thirdly, we would send one to an independent
2 analyst, usually a PRA expert, just as a quality check
3 on the work. And there may be more. If you have
4 special technical areas we would try and get a review
5 by an expert in whatever technical discipline was
6 involved. They have all been collected together. The
7 comments are resolved and then it goes back to the
8 management review.

9 In this particular case the prioritization
10 write up was completed in six rather intensive weeks.
11 The concurrence review then lasted 197 days. I might
12 add also that this is not 197 days of benign neglect.
13 This is 197 days with gentle reminders, not so gentle
14 reminders, sometimes more forceful reminders.

15 I was often reminded many years ago when I
16 was in college and I worked in a public library and
17 had to remind people, sometimes professors at a local
18 university, that it was time to bring back the books.
19 It's not always easy to get this.

20 Well, why did it take so long? We all
21 agreed this was too long a period. Speaking to people
22 in retrospect it was probably pretty obvious. This is
23 a 20-page write up, one with a lot of meat in it, well
24 marbled with figures, tables, drafts, and equations.
25 It was not the sort of thing that you could just read

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1 and pass on.

2 In fact, I think this is characteristic of
3 any generic issue write up. It's usually not the sort
4 of thing you can read a few pages one day and as time
5 goes by the next day pick up a few and so on.

6 This is something where you have to set
7 aside a few days and read it, ponder it, and
8 understand it, which people wanted to do. They were
9 very well motivated but these are busy people so in
10 retrospect I can't say that it's that surprising.
11 Clearly you've got to do better than this.

12 Moving on to materials issues which Ron will
13 discuss.

14 MR. LEITCH: But if I'm reading the data
15 correctly, it looks as though using the new system you
16 would be pretty pleased with 197 days.

17 MR. VANDERMOLEN: These thoughts have gone
18 through my mind. We'll talk about that in just a
19 moment.

20 MR. LLOYD: The next slide, No. 9, has to do
21 with the candidate materials that were presented
22 through the materials area, NMSS. As I mentioned
23 before, none of the candidate issues had specific
24 comments as they went through each one of those issues
25 but we did have some generic sorts of comments on the

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1 process itself.

2 Recapping a little bit, going back to that
3 table that was presented earlier on slide No. 4, each
4 of the issues I thought NMSS did a really outstanding
5 job. These were brought up in, like I said, October
6 of 2000. There were panel meetings that came up very
7 soon after that.

8 I think they were very well prepared. They
9 looked through the issues and came to the appropriate
10 conclusion, each of those being dropped because of
11 situations that led them outside of the generic issue
12 program.

13 The leaking pools which was the first one
14 was initially a B&W issue with casks where they had
15 radioactive material in it, where they had water that
16 was leaking, and there didn't appear to be any
17 regulatory requirement to go out and track water that
18 was seeping out and measure the radioactivity and so
19 on.

20 They found subsequent to that that this was
21 an isolated case and the water never really got
22 outside of the bounds where it would do any problem
23 anyway so that one was eliminated.

24 The second one, unlikely events, I guess
25 would be parallel. You would look at kind of a duel

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1 train system and a reactor situation. The ANSI
2 standard 8.1 allows them to take unlikely events and
3 say, hey, that's not going to happen and that sort of
4 fills the second train criteria.

5 Therefore, you don't have to worry about it.
6 Inspections realized that even though certain
7 licensees were taking advantage of this classification
8 of unlikely events, they actually had failures in
9 those systems where they were saying this was an
10 unlikely event. This was the key that got them into
11 maybe they had other problems and other sorts of
12 situations where we have unlikely events and different
13 licensees.

14 I looked at that one and that came back and
15 it was determined that once again this was an isolated
16 case. It was with the Portsmouth gaseous diffusion
17 plant that the issue was at.

18 There were some changes made that came out
19 of that so there was a positive part of this. This
20 was the subpart H of 10 CFR 70 that got changes. That
21 was also a letter that was sent out to licensees
22 reminding them they should look into these areas and
23 fix those things.

24 The third one that was tracked through NMSS
25 was the gammaknife. That's the gamma stereotactic

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1 radio surgery. There were several misadministrations
2 where they actually got the coordinates of where they
3 wanted the dose distributed incorrectly. In some
4 cases they got the two axis backwards.

5 Out of this rather than continuing on with
6 the generic issue process and calling it a generic
7 issue, they then processed it in a lower level format.
8 It was IEN generated. It was 2000-22 which told all
9 those types of licensees of the kinds of problems that
10 were generated, the human errors that were generated,
11 and so on.

12 This was an example of how the new procedure
13 would tend to go. You would have a quick analysis of
14 where's the risk and is it generic. Go through your
15 panel and come to a consensus with the panel hopefully
16 on whatever that decision would be.

17 If the answer is not let's process it as a
18 generic issue but let's call it some other form of
19 generic identification, then let's do it with the
20 easiest possible pathway. That's what NMSS did here.
21 It was done through the IEN or the genetic
22 communications process.

23 Next slide, please. I have some positive
24 things about the process itself. Several of these are
25 kind of interrelated as you look down through the

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1 bullets. Most of them have to do with saving staff
2 resources at various stages of in the game.

3 The first one would be to save resources
4 obviously for those issues that would be proposed that
5 were of low risk that would never meet the thresholds.
6 Therefore, why waste your time doing analysis if
7 you've already got a very good idea from a group of
8 experts that would say, "If we don't need to do that,
9 we're smart enough to determine that we're not going
10 to meet that threshold so let's drop the issue
11 entirely or possibly go and do it under some other
12 sort of a format like the generic communications
13 process."

14 When you get down to the compliance issue,
15 if you actually determined there was a compliance
16 issue and you did some analysis on it, at least you
17 would have some sort of a technical basis to give back
18 to NRR or give back to NMSS or whoever is working the
19 issue that would help them in that compliance arena.

20 NMSS felt that the formality of the process
21 gave it visibility. At their meetings I was very
22 impressed that their panel was quite large. There
23 were a lot of people that attended the meeting, not
24 only the panel people themselves but other people who
25 were interested.

1 I think a lot of discussion took place at
2 that time so there was a lot of visibility given to
3 the process so they got some respect, I guess, is what
4 we're saying here.

5 They also thought that the flexibility of
6 the handbook, which is a guidance document, was
7 written not to be a verbatim compliance document where
8 you had to do step one, two, three in order and check
9 off all the blocks. It is a guidance document.

10 They use it as a guidance document and took
11 those things out of the handbook that best fit them in
12 addressing the issue at hand. In that way, they had
13 flexibility to do what they did based on what the
14 generic safety issue was.

15 The next bullet down, the processing time
16 may be shortened. I already mentioned that, that you
17 could eliminate unnecessary analysis because of
18 whatever the thresholds might be that you're not able
19 to meet them.

20 They also thought there was a consensus on
21 the scope of the generic issue early on. This was
22 perceived by many as something that the old process
23 possibly needed some fine tuning on and that was to,
24 as Harold mentioned earlier, too, try and define what
25 the scope of the issue is quickly so it's something

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1 that everybody can get arms around that you can
2 define, that you can see what the analysis should be,
3 and then go ahead and work it as opposed to something
4 that is foggy and too broad.

5 Next slide, please.

6 I did all the good stuff. Harold can do the
7 rest.

8 MR. VANDERMOLEN: I get to do the
9 shortcomings and limitations which also exist. The
10 first one I think we've already discussed quite a bit.
11 It's been administratively cumbersome. That's party
12 because, as I said before, it's not hard to get
13 people. It is very hard to get certain people. The
14 people you really want for these things are often
15 people who are very much in demand, very heavily
16 committed.

17 What makes it even worse, particularly for
18 reactor issues, you're dealing with two offices and
19 all the implications that would imply. It's not easy.
20 You have to get memos back and forth on a high level.
21 It takes a while.

22 Also, the initial screening stage, which is
23 the panel meeting, may not provide a sufficient basis
24 for decision making. At this point you haven't done
25 a quantitative or any semi-quantitative analysis, just

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1 looking at the issue.

2 One of the outcomes the panel can vote on
3 according to the management directive is to drop it
4 based on it having very little -- I'm trying to quote
5 it as exactly as I can -- very little chance of
6 meeting the threshold criteria.

7 That's not so easy to do in practice. In
8 fact, it's not always easy to make conclusions based
9 on an actual quantitative PRA analysis. When you're
10 trying to do it before you even do the analysis it
11 gets a little bit more difficult still.

12 The threshold for processing candidate
13 issues is not clearly defined for materials issues.
14 What that means is there is an Appendix C attached to
15 the handbook of the management directive that gives
16 the criteria for reactor issues in terms of LERF and
17 the usual PRA parameters. We don't have an analogous
18 one for materials issues. We really need to develop
19 something like that.

20 The documentation of "closed" issues for
21 materials issues could be enhanced. The existing
22 process is in an RES office letter. It only applies
23 to RES but there is a very definite process we go to
24 when we finally decide we're done with a generic issue
25 how do we close it out. The answer is a resolution

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1 package is written and, as I'm sure you all know, it
2 comes down here for review.

3 After that, assuming all you gentlemen give
4 us a positive letter, the letter is attached to the
5 package, a cover letter goes on top. There is
6 definite guidance on who concurs on it but it's signed
7 by our office director and goes to the EDO. A similar
8 thing had not been developed for NMSS and that's not
9 really specified in the management directive.

10 Finally, we need a clear link between
11 management directive 6.4 and GIMCS. GIMCS stands for
12 generic issue management control system. It's our
13 tracking system for all of the generic issues.

14 There is no requirement to use that
15 specifically in the management directive. It just
16 says that you want to have quarterly reports, although
17 it's no problem when you're doing everything within
18 research because research administers the system.

19 In fact, we are upgrading the system event.
20 It used to run for many years under quarterly
21 publications and we are trying right now to put it on
22 the World Wide Web as well. It is public. Having
23 gone through all that, we would like to keep GIMCS as
24 our agency-wide tracking system and have everything on
25 all generic issues in one place.

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1 Moving on to the next slide, these are more
2 observation. The last slide had shortcomings. These
3 are observations. Not all of them are problems. The
4 issues are complex. They do result in a significant
5 amount of review time and some conflicts with other
6 priorities.

7 The fact of the matter is nobody -- nobody
8 puts a simple problem into the generic issue process.
9 If you run across a simple question, you just go ahead
10 and solve it. You don't go through all this. The
11 ones we get are virtually guaranteed to be thorny.

12 I think if I did this over again I would
13 strike that word often. If you have a generic issue,
14 count on it. Actual practice says that it's not going
15 to be simple or straightforward. It's going to take
16 a little bit of effort to investigate and make these
17 decisions.

18 DR. KRESS: What's the incentive or
19 motivation for staff to serve on this panel? Because
20 it's their civic duty?

21 MR. VANDERMOLEN: For reactor issues we
22 provide them free donuts.

23 DR. KRESS: Okay.

24 MR. VANDERMOLEN: Other than that, they have
25 to get all of their work done. Even with the free

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1 donuts we didn't always get everybody quite as eager
2 to serve as we want.

3 Issues can involve several disciplines. In
4 just the issues we've talked about, we've had to
5 consult people who had expertise in metallurgical
6 sciences, expertise in reactivity, thermal hydraulics
7 and thermal hydraulic phenomenon, post-accident
8 phenomenon maintenance practices, the engineering of
9 motor operated valves.

10 All of these things and you inevitably are
11 going to wind up with a fairly large number of panel
12 members. The higher the number of panel members, the
13 harder it is to get everybody together.

14 I say that in the context of the next four
15 bullets which manage to pull us in four orthogonal
16 directions, hard to do in a Euclidian space. The key
17 is that third bullet from the bottom.

18 It's difficult to establish a panel and
19 complete initial screening stage within the required
20 30 days. Now, for one thing, it can take you at least
21 a week and more likely two weeks just to get the metal
22 out establishing the panel. Going through all of this
23 in 30 days, it's just not realistic.

24 Backing up to the bullet right above it,
25 greater commitment from NRC staff will be required to

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1 establish panels. What we ran into here is that we
2 discovered some of the offices were budgeting
3 something like \$100 for the year for these panels.

4 That would be fine if they gave us
5 perfunctory things to do but you give us stuff where
6 we're going to have briefing packages that are this
7 big and then have a combined total of \$100 for all
8 issues. That's not realistic. I'm not complaining.
9 The offices had to budget something and we didn't have
10 the experience back then to find out.

11 When we finish this up we are going to check
12 how many hours were spent on these panels and we'll be
13 able to budget more appropriately.

14 Going on, there is still a desire by NRR for
15 a more in depth risk based evaluation prior to
16 drafting an issue from the generic issues program.
17 When you get a generic issue somebody really believes
18 in it. Now, some of these come from DPOs and we don't
19 discourage this. This is how we handle a lot of them.
20 Most of them actually come with the full backing of
21 NRC management.

22 If the panel votes the thing into a drop,
23 possibly that makes some people happy but someone
24 thought enough of this issue to send it and it just
25 doesn't work just to have a panel vote. You have to

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1 have some basis. The panel has to document it as well
2 and it's clear we have to have good guidance on how we
3 do that documentation. It's just not going to wash
4 just to say they voted.

5 Finally, as Ron mentioned earlier, if you
6 have an issue that is voted to be a compliance issue,
7 in theory that was supposed to say, okay, it's a
8 compliance issue. It's not a generic issue. Give it
9 back to NRR or NMSS. You've got the tools you need
10 already to fix it. Just tell them to go do what they
11 are supposed to do. Tell your licensees to do it.

12 Well, the people who have to enforce them
13 want to be risk informed as well. What happened in
14 reality with the heavy load issues, they came right
15 back and said, "Tell us how important it is." That's
16 an honest question and deserves an honest answer so we
17 wind up doing the problemistic evaluation anyway.

18 Going on to the next slide, a few other
19 observations. The previous generic issue process did
20 not work so well either. I think it's pretty clear
21 that we can't just go back to the old process. We do
22 need some improvements. But we do feel that this
23 whole process we've gone through comparing the two
24 issues, although it had its frustrations, and I think
25 Ron and I have more opportunity to be frustrated than

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1 anyone, we do feel it was worthwhile.

2 I do want to add one more caution before we
3 get into the recommendations and that is these lessons
4 learned are not all inclusive. We haven't gotten
5 anything all the way through the process. We probably
6 have gotten most of the differences by going through
7 the first three stages. At this point we haven't had
8 any issue get past stage 3 of the management
9 directive.

10 Stage 4 when you get into technical
11 assessment, then you are going to contractors and
12 spending big money. You are really working the issue
13 and you'll have task action plans and all this sort of
14 thing. That takes a lot longer but that's what needs
15 to be done to fix these issues.

16 Going on, Ron.

17 MR. LLOYD: The next slide has to do with
18 the recommendations based on our lessons learned from
19 taking a look at both reactor and materials issues.
20 The first thing kind of going through in chronological
21 order as to really clarify the information that's in
22 Appendix A.

23 Right now Appendix A is basically a table
24 that list a whole bunch of items. It says to the
25 person that wants to submit one of these things

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1 whether it's outside the agency, with the industry, or
2 inside the agency, "Here are a whole bunch of things
3 that you need to put down which would include what you
4 think the issue is, what you think the basis for the
5 issue is, whether there's a regulatory problem.
6 Also, what you think might be a solution to this
7 problem."

8 When it gets to the panel, they would have
9 a good idea of what the scope should be of that issue
10 and that there should be some sort of direction for
11 the panel to take from which to go out and do
12 something.

13 I think Appendix A, or the documentation
14 that would surround A, ought to be kind of flushed out
15 a little bit. I think there would be much time, I
16 think, spent in trying to figure out the scope. I
17 think that needs to be clarified so everybody knows
18 what the scope is. I think the appendix could be made
19 more user friendly so better information could be put
20 down. Another thing would be to actually enforce the
21 fact that whoever wants to submit a generic issue and
22 actually fill out Appendix A and provide that
23 information rather than saying, "Yeah, I've got a
24 bunch of information for you. Go do your thing," and
25 then not follow the procedure in its entirety.

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1 Another one was the initial screening stage.
2 As Harold mentioned, it was difficult sometimes to
3 limit the scope there. If you've got a bunch of
4 engineers together, they want a lot of data upon which
5 to make a decision.

6 Consequently, the initial screening state,
7 which was really supposed to be kind of a basic look
8 at the background, what was on Appendix A, and some
9 basic kinds of information, really got into doing the
10 kinds of things that were in subsequent stages within
11 the management directive.

12 We had proposed here to limit some of the
13 scope and make sure that people that were on that
14 particular stage understood exactly what they were
15 supposed to do.

16 Which gets us down to the third bullet. We
17 felt that collapsing either stage three and four into
18 one stage or stage two into three, and most likely
19 stage two and three together would save some time and
20 cut back on the amount of administrivia you would have
21 to go through in order to process an issue.

22 Right now stage one is identification which
23 is basically here's my background information as to
24 why this might be a generic issue. The second stage
25 is the initial screening which is basically to review

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1 the preliminary information.

2 When you get to stage three, it's technical
3 screening and that is supposed to be sort of a quick
4 look based on expert opinion and analysis of what the
5 situation is.

6 Then by the time you get to stage four, you
7 are more of an in depth look. The in depth look would
8 include things like going out to licensees, gathering
9 data, doing PRA studies, getting a contractor, and
10 other kinds of things to get more hard data upon which
11 to make a decision.

12 We felt there were some similarities in
13 here. Most likely the best thing to do would be to
14 collapse stages two and three and make one that would
15 best benefit the needs of everybody. It would save
16 time and cut back on the administrivia that really
17 isn't necessary.

18 Another issue that we had a problem as we
19 did our very first one which was on the heavy loads
20 area. We had our panel together and there were some
21 questions as to what adequate protection really meant
22 and what substantial --

23 CHAIRMAN APOSTOLAKIS: Did you answer it?

24 MR. LLOYD: You guys have answered that,
25 right?

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1 MR. VANDERMOLEN: I have every confidence in
2 all of your deliberations.

3 MR. LLOYD: We went through and I took a
4 look at all the documentation and everybody trying to
5 figure out what adequate protection means. Of course,
6 we are still trying to figure that out today. We did
7 have a guest speaker come. Joe Murphy came and talked
8 with us and he gave us his best interpretation of what
9 all that meant. At least we had some input there.

10 As far as where the thresholds are, where
11 your safety goal fits in, we tried to explain what
12 that was. What we ended up doing was basically using
13 the guidance that we have in Reg Guide 1.174 and that
14 was just basically copied right into Appendix C of the
15 management directive. We used the best guidance that
16 we have to date.

17 If somebody here in the ACRS panel or in the
18 agency is able to come up with a good definition of
19 what adequate protection means with thresholds in
20 there, we would gladly put that into the management
21 directive and use some better information. Right now
22 we're using the guidance that is provided by Reg Guide
23 1.174.

24 Next slide. For the materials issues, as
25 Harold brought out, we really don't have any

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1 thresholds that are out there that would give them a
2 good idea as to whether this is an adequate protection
3 issue or whether it's a safety enhancement issue or,
4 to a lesser extent, a burden reduction issue.

5 We ran into the same problem when we were
6 going through the inspection program trying to figure
7 out under each one of the basic categories how much
8 should we inspect, when should we inspect, what the
9 frequency should be, what the impact on core damage
10 frequency is.

11 If you're looking at an inspection issue
12 from a reactor standpoint, how should you interpret
13 that when you get over into the HP areas, the
14 safeguards areas, the materials issues, the
15 irradiators, those other kinds of things where you
16 have different consequences of did things go bad.
17 We really need to come up with something that NMSS and
18 others could live with that would provide better
19 guidance than what we've got right now.

20 The documentation, as Harold mentioned, we
21 really need to add some additional information in
22 there on actually how to close things out as we come
23 to conclusions from the panels and other things that
24 we know what we should do.

25 That means what is the proper format for

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1 closing these things out. What's the proper
2 distribution for closing these things out. What is
3 the level of detail that is really needed. Can you do
4 this in a three or four-page memo or do you need
5 additional information that would attach some sort of
6 small report in order to make it go on to the next
7 step or to make the decision to drop that issue
8 completely. Those things could be clarified.

9 The other one is on GIMCS. It's not
10 mentioned in management directive 6.4 right now. At
11 the time we wrote the draft we thought that we
12 wouldn't be using GIMCS and so what's in the
13 management directive is NUREG XXX.

14 What we've really decided to do, I believe,
15 is to continue on with GIMCS but we are going to
16 update it and it will be put on the Web so people will
17 be able to get access to it. That change will have to
18 be made.

19 Clarify the level of technical analysis that
20 would be done within the scope of the MD. I think
21 this should be more explicit at some of the early
22 stages, once again to eliminate wasted time at
23 addressing some of the issues that are of low risk
24 significance and wouldn't meet any threshold.

25 The next slide we've got is a tentative

1 schedule for the next few months.

2 DR. KRESS: In your recommendations I didn't
3 see anything to do with the problem of getting a panel
4 together.

5 MR. LLOYD: Those kinds of things, as Harold
6 mentioned, those would exist with the old system.

7 DR. KRESS: Those exist no matter why.

8 MR. LLOYD: Those exist no matter why.

9 DR. KRESS: No way to help that process? Do
10 you have your own separate budget for generic issues?

11 MR. VANDERMOLEN: No, we do not. Generic
12 issues process is no contract dollars whatsoever.

13 DR. KRESS: It's a stepchild.

14 MR. VANDERMOLEN: And a fairly small team,
15 exactly half of which is sitting up here at the table
16 at the moment. The other two, I see one in the
17 audience. That's it.

18 MR. LLOYD: We're a small group. I think
19 that was one of our issues from the administrative
20 standpoint. We need to really raise this to a level
21 of where people could be made available and that they
22 would also realize what the approximate time
23 commitment would be.

24 I think that ought to be put in the memo.
25 I think offices should then be encouraged to stick

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1 that in their budget. Assuming if we get the same
2 amount of generic issues coming in, if we got four to
3 six of these things in the period of a year, that
4 equals X number of hours and then the different
5 offices would just budget that amount.

6 DR. KRESS: Just getting that guidance to
7 the offices might help.

8 MR. LLOYD: We should be able to provide
9 guidance to the offices as to what to expect so it
10 wouldn't be a surprise to them. Good point.

11 Slide 16 shows what we would like to do is
12 to make some basic revisions based on lessons learned
13 by the end of this month. That would then go through
14 management review and research for a couple of weeks
15 and then try to get it from the Office of Research by
16 April 10.

17 We would also notify the EDO as to what
18 we're doing in a memo that would basically forward our
19 lessons learned. Then we would give everybody
20 approximately a month to go through and do their peer
21 review, get comments back to us by about mid-May, and
22 then take the following six weeks to address those
23 peer review comments, make the changes, and then get
24 it once again out of Research by the end of June.
25 It's an aggressive schedule.

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1 DR. KRESS: It looks like May 11th time
2 frame might be a good time for us to look at your
3 changes and maybe make our comments then.

4 MR. LLOYD: Sure. You bet.

5 MR. LEITCH: I have a couple of questions.

6 MR. LLOYD: Sure.

7 MR. LEITCH: On the average how many of
8 these issues are being identified per year?

9 MR. LLOYD: I think we are probably looking
10 at right now maybe four to six.

11 MR. LEITCH: Four to six. And what is the
12 average age of the open issues?

13 MR. LLOYD: It depends on what time period
14 you're looking at. Some of these if you go back in
15 time, we were looking at 15 to 20 years on some of
16 these issues.

17 MR. LEITCH: I mean currently the ones that
18 are open.

19 MR. LLOYD: Currently that ones that are
20 open we've got --

21 MR. VANDERMOLLEN: We've had some that go
22 back 20 years. Having said that, I realize also that
23 they go through a priority order based on these
24 quantitative estimates, not on their chronological
25 age. The ones that tend to be left are the ones that

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1 were either very difficult to do or weren't of top
2 safety significance. I'm not trying to apologize that
3 they are that old.

4 MR. LEITCH: How many are open at the open?

5 MR. VANDERMOLEN: Ron Emerette, how many are
6 open right at the moment? How many generic issues are
7 open right now?

8 He'll tell you in a moment.

9 MR. EMERETTE: About 12.

10 MR. VANDERMOLEN: About 12 right now. We
11 are also working these generic issues and we're
12 getting for or six of them done.

13 DR. SHACK: Are you working them all with
14 the new process or half?

15 MR. VANDERMOLEN: No, the older ones, the
16 ones that are already in process, are still under the
17 old process. What really makes them move is that we
18 report to Congress every month on our progress and the
19 end date of our task action plan goes to the Hill.

20 They don't pay too much attention to our
21 intermediate milestones but if we don't make the final
22 one, we don't like to think about that possibility
23 because we try making deadlines.

24 MR. LEITCH: Are the goals of the new
25 process to reduce the time or improve the quality?

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1 What was the problem with the old process? Is it a
2 quality issue or a timeliness issue?

3 MR. VANDERMOLEN: That's a little bit
4 difficult for me to answer for two reasons. One is 20
5 years ago Tom Cox and I together wrote the old process
6 so I guess I have a vested interest in it. The other
7 reasons is that this management started based on about
8 three years ago.

9 After the first draft had completed the
10 office reorganized and I came in one day and
11 discovered that I was once again in the generic issues
12 process and the other people were not. The day
13 ironically was April 1 of 1999 which I thought was a
14 most appropriate date.

15 I can't completely answer the question. I
16 think candidly people were having problems getting the
17 probabilistic analysis done. I think part of it was
18 they weren't following the old process that closely
19 either. It wasn't that the old process was so bad but
20 it was sufficiently difficult to use it and people
21 were not following it.

22 MR. LEITCH: Is the prioritization step in
23 the old process? I don't see a similar step in the
24 old process.

25 MR. VANDERMOLEN: It's the technical

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1 screening stuff.

2 MR. LEITCH: I see.

3 MR. VANDERMOLEN: At this step it comes in
4 and we do a probabilistic analysis of it using what
5 resources we have in house. That is, although we once
6 had a contract on it, we don't go to licensees for
7 information. We don't spend major dollars on it.

8 What we found is that at least 80 percent of
9 the time based on the information we have in house we
10 can say that this is a drop. If there's any doubt,
11 that is, if we have unknown information, we put down
12 a conservative figure.

13 This is how it differs from most PRA
14 calculations that you'll see here. PRAs are supposed
15 to be completely realistic. Then if there's doubt, we
16 continue with it and then we go over to the next stage
17 and spend money and do it right.

18 DR. BONACA: Just as an answer, if I
19 remember, one of the major concerns was that because
20 the first screening was not -- didn't have sufficient
21 probabilistic analysis at the time, an issue was
22 classified as potentially generic significance, would
23 get there and then sit there for a long time and then
24 years later would be evaluated and then dropped. You
25 had a lot of potential GSIs. If I remember, that was

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1 one of the issues.

2 MR. VANDERMOLEN: There was a significant
3 backlog. It depends. When you get a reactor event
4 happening, even one that is a precursor and wasn't
5 really directly any kind of major threat, but we try
6 and learn as much as we can. Every time that happens
7 a flurry of generic issues comes. These do not come
8 in on a regular basis. I'm almost afraid to say this,
9 but they tend to be somewhat stochastic in their
10 occurrence. You never know if you'll get none for a
11 long time and then you've got three or four together
12 all at once. That's one reason why the backlog
13 develops.

14 I have to say also that doing the
15 probabilistic analysis we read them after the fact and
16 they look very straightforward but they look very
17 differently when you start out with what I call NRC
18 Form 0, a blank sheet of paper.

19 It's not always easy. Sometimes it takes a
20 bit of thought, consultation, and work to actually do
21 the issues and we can't do all of them. We can do
22 most of them but we can't do all of them.

23 Other questions?

24 DR. WALLIS: You have a new process in draft
25 form and you want to assess it but nothing so far has

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1 got beyond step three, technical screening. The real
2 work is done when you do technical assessment and
3 develop regulations and guidance. No one has done
4 that yet. It's a new process. How can you come up
5 with a well-developed process when you haven't tested
6 it yet in the main part?

7 MR. VANDERMOLEN: It is quite possible that
8 we would have to go back and revise it again. The two
9 aspects that I can say in partial reply, one is that
10 when you get into the later stage of the issue,
11 there's not that great a difference between the
12 existing and the new process. They run much more in
13 parallel. It's more that we track them further down
14 rather than at a certain stage turn them over to
15 another program.

16 The other is most issues don't make it that
17 far. It's a fairly rare occurrence but a very
18 significant occurrence when an issue makes it all the
19 way through. In most cases, even when we go into
20 complete technical assessment and really investigate
21 the issue, it becomes a major research program and we
22 may well find when we have all the information that
23 this does not meet the criteria for any kind of
24 regulatory action. It's pretty rare that things go
25 all the way through. We have to allow for that

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1 possibility, of course, and we have to do it with some
2 vigilance.

3 MR. LLOYD: I would say that the old process
4 went through those same set of phases as far as if you
5 had rule making to do or some other kind of thing to
6 do. You had corrective actions to come up with.

7 You had to figure out whether or not
8 licensees actually implemented those corrective
9 actions and verified that they were acceptable, that
10 they would, in fact, solve the problem at hand. Those
11 kinds of things were done under the old process. The
12 difference was is there wasn't a procedure. They
13 tried to track it.

14 I think all we really did in that whole
15 formulation process was to go through NMSS, go through
16 NRR, and get that process that was being used, give it
17 our best shot at how to make it smooth, and go as
18 smoothly as possible, and then we put it down on a
19 piece of paper.

20 That's what you see under stages five, six,
21 seven, and eight, the backend of the entire management
22 directive. The frontend, as Harold mentioned, is
23 really the part where you try to resolve the issue.
24 After you've made a decision whether or not you're
25 going to drop it, most of these would end up in the

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1 drop category.

2 It was perceived, I think, by the agency and
3 by Arthur Anderson, that helped us out on this, was
4 that if you had a committee of experts looking at it
5 initially, that you could come up with a pretty good
6 fix on whether or not this would pass risk thresholds
7 and, therefore, if we can get a real good fix on that,
8 why should we go through and expend all of the
9 resources to do that which we could do in a much
10 shorter period of time.

11 If, in fact, we decide to move it on to
12 another stage and to go out and do a real in depth
13 analysis from a PRA standpoint, then we would go ahead
14 and do that and there would be very little difference
15 between what we would do under this procedure than
16 what was done under the old procedure.

17 You might have one person doing it under the
18 old procedure as opposed to a committee doing it under
19 this procedure. We were looking basically for
20 efficiencies and then also some staff reduction time
21 because you've got to realize that we are cutting back
22 staff.

23 DR. WALLIS: Do you have measures of those
24 efficiencies and staff reduction times?

25 MR. LLOYD: We don't.

1 DR. WALLIS: Do you have measures of these
2 efficiencies?

3 MR. LLOYD: As Harold mentioned, we are
4 going to try to go back through and based on the
5 timekeeping situation look at what was actually spent
6 on these issues because we do have codes to charge
7 against and we'll take a look at that.

8 CHAIRMAN APOSTOLAKIS: Okay. Any other
9 comments? Thank you very much, gentlemen.

10 (Whereupon, at 3:46 p.m. the meeting was
11 adjourned.)

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CERTIFICATE

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

Name of Proceeding: Advisory Committee on

Reactor Safeguards

Docket Number: (not applicable)

Location: Rockville, Maryland

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



John Mongoven
Official Reporter
Neal R. Gross & Co., Inc.

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**SUGGESTIONS FOR ENHANCING THE
SPENT FUEL POOL RISK ASSESSMENT**

Presented by:

**Robert E. Henry
Lynette Hendricks**

**Presented to:
ACRS**

March 1, 2001

ISSUES TO BE DISCUSSED

- Likelihood of SFP failure given a cask drop.
- Fission product releases if the SFP is postulated to be rapidly drained.
- Peer review of the report.

STATUS

- The draft study provides a good start for quantifying the risk of significant fission product releases from spent fuel pools.
- The study provides a good basis for evaluating the probability of losing cooling to the fuel pool.
- The study should incorporate the results of large scale spent fuel pool cask dropping experiments as well as those investigating large impact loads on reinforced concrete walls.
- The study currently represents the bounds of possible releases of ruthenium, we believe it should also provide a best estimate analysis consistent with relevant fission product release experiments.

-Assessing the Consequence of a Cask Drop – IMPORTANT EXPERIMENTS CHARACTERIZING CONCRETE TOUGHNESS

- BNFL, 1984, "Full Scale Drop Test for Benchmarking Concrete Pads for Dry Spent Fuel Storage Casks: Tests 3 and 4," BNFL Commercial-In-Confidence Report AEA-D&W-0676 (work performed at AEA Technology, Winfrith).
- BNFL, 1993, "Full Scale Drop Test for Benchmarking Concrete Pads for Dry Spent Fuel Storage Casks," BNFL Commercial-In-Confidence Report AEA-D&W-0622 (work performed at Sandia National Laboratories).
- Witte, M. C. et al., 1998, "Summary of Evaluation of Low-Velocity Impact Test of Solid Steel Billet Onto Concrete Pads," NUREG/CR-6608, UCRL-ID-129211.
- Stephenson, A. E., 1977, "Full-Scale Tornado-Missile Impact Test," EPRI Report NP-440 (work performed at Sandia Laboratories).

**SIMPLIFIED APPROACH FOR ASSESSING
DAMAGE (PENETRATION DEPTH)
TO THE CONCRETE**

M	-	mass of the cask.
h	-	drop height.
U	-	impact velocity.
ΔP	-	compressive strength of the concrete.
A	-	area of impact.
δ	-	depth of penetration.
KE	=	$1/2 MU^2 = \Delta P A \delta$
δ	=	$\frac{MU^2}{2 \Delta P A} = \frac{M g h}{\Delta P A}$

RESULTS OF BNFL (AEA/SNL) CASK IMPACT TESTS

Test Conditions

Mass of the test cask	64.5 tonnes
Average concrete compressive strength	22 MPa

Test #2

Drop height	18 in. (0.46 m)
Calculated free fall velocity at impact	3 m/sec
Kinetic energy of cask at impact	2.9×10^5 J
Calculated compression of the concrete	8 mm
Measured compression (depression of surface)	4 mm

Test #3

Drop height	40 in (1.02 m)
Calculated free fall velocity at impact	4.5 m/sec
Kinetic energy of cask at impact	6.5×10^5 J
Calculated compression of the concrete	17 mm
Measured compression (depression of surface)	6 mm

Test #4

Drop height	60 in (1.52 m)
Calculated free fall velocity at impact	5.5 m/sec
Kinetic energy of cask at impact	9.8×10^5 J
Calculated compression of the concrete	26 mm
Measured compression (depression of surface)	8 mm

RESULTS OF EPRI MISSILE TESTS

Test #10 – 12" thick reinforced concrete

Missile: 12" pipe – 743 lbm (338 kg)

Velocity: 143 ft/sec (43.6 m/sec)

KE = 3.2×10^5 J

$\Delta P = 3690$ psi (25.4 MPa)

$F = A\Delta P = 1.8 \times 10^6$ N

$\delta = 0.2$ m; $\delta_{\text{measured}} = \text{complete penetration}$

Test #12 – 18" thick reinforced concrete

Missile: 12" pipe – 743 lbm (338 kg)

Velocity: 203 ft/sec (61.9 m/sec)

KE = 6.5×10^5 J

$\Delta P = 4535$ psi (31.3 MPa)

$F = A\Delta P = 2.2 \times 10^6$ N

$\delta = 0.29$ m; $\delta_{\text{measured}} = 7.5$ in. (0.19 m)

(observed some spalling off the back face)

Test #9 – 18" (0.45 m) thick reinforced concrete

Missile: 12" pipe – 743 lbm (338 kg)

Velocity: 143 ft/sec (43.6 m/sec)

KE = 3.2×10^5 J

$\Delta P = 3545$ psi (24.4 MPa)

$F = A\Delta P = 1.78 \times 10^6$ N

$\delta = 0.18$ m; $\delta_{\text{measured}} = 5$ in. (0.127 m)

(no spalling off the back face)

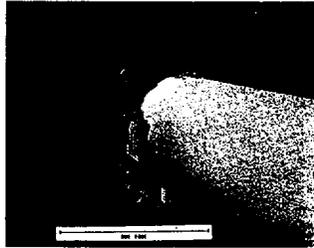
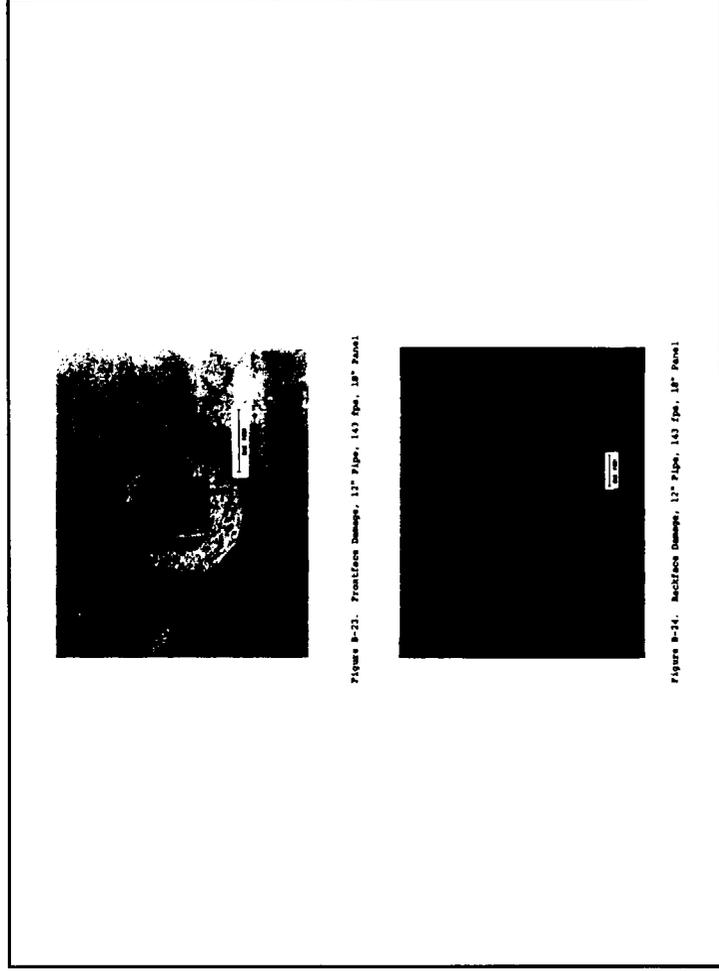
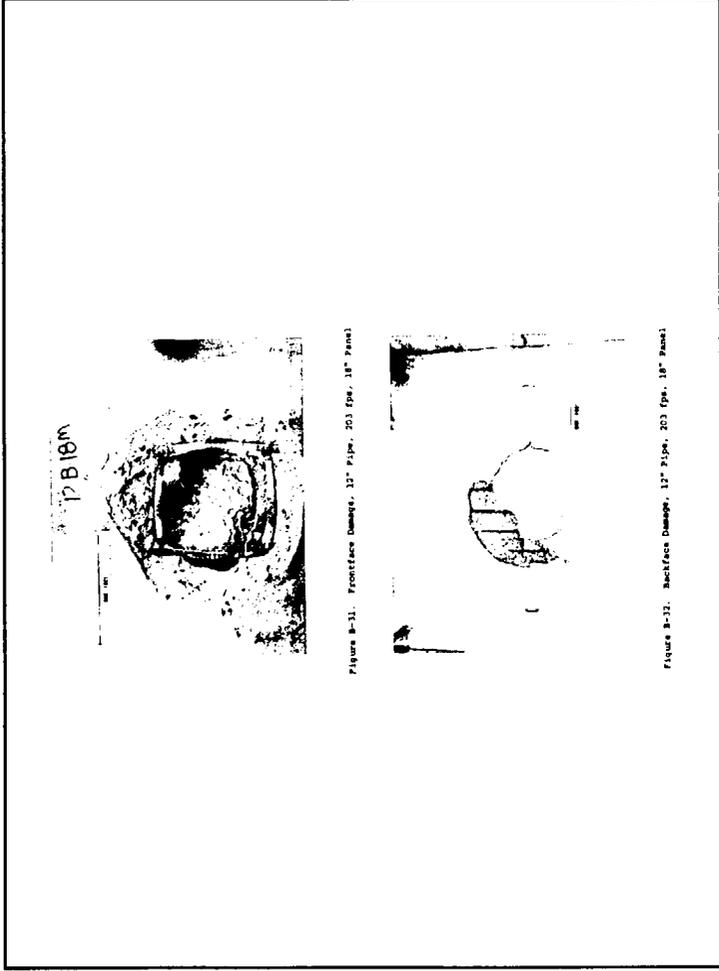


Figure B-27. Frontface Damage, 12" Pipe, 143 fps, 12" Panel



Figure B-28. Backface Damage, 12" Pipe, 143 fps, 12" Panel
(Concrete appearing through hole is another test panel)



**SUMMARY OF THE EPRI 12" PIPE (743 lbm/388 kg)
MISSILE IMPACT TESTS**

Test	Impact Velocity (ft/sec)(m/sec)	Concrete Strength (psi/MPa)	Concrete Thickness (in/cm)	Measured Penetration (in/cm)	Calculated Penetration cm	Ratio of Calculated to Total Thickness	Observation (Spalling)
14	92/28.1	3545/24.4	12/30.5	3.9/9.9	7.5	0.25	Slight
16	92/28.1	3350/23.1	12/30.5	3.5/8.9	7.5	0.25	Slight
11	98/30	3595/24.8	12/30.5	4.5/11.4	8.4	0.28	Some
9	143/43.6	4325/29.8	18/46	5/12.7	14.7	0.32	None
10	143/43.6	3690/25.4	12/30.5	Perforation	18	0.59	Perforation
15	152/46.4	4205/29	18/46	5.3/13.5	17	0.37	Slight
17	157/47.9	4255/29.3	18/46	4.1/10.4	18	0.39	Slight
4	198/60.4	3560/24.6	18/46	6.8/17.3	34	0.74	Extensive
3	202/61.1	3350/23.1	18/46	7.0/17.8	38	0.82	Extensive
12	202/61.6	3795/26.2	24/71	6.8/17.3	29	0.41	Some
18	213/65	4690/32.2	18/46	9.1/23.1	30	0.65	Hole Opened

**SUMMARY OF RESULTS FROM
CONCRETE IMPACT TESTS**

- The large scale cask drop experiments demonstrate minimal damage associated with the cask drop events from 18 inches, 40 inches and 60 inches.
- The observations from high velocity missile impact experiments demonstrate results that are consistent with those observed in the cask drop test, i.e the depth of penetration is approximately ½ or less of the calculated value.
- Only relatively small cracks appear before “spalling” is observed in the back side of the concrete wall.
- The high velocity impact tests show that “spalling” on the back side of the concrete wall occurs when the calculated penetration depth is approximately half of the wall thickness.
- Without “spalling”, there would be no large leakage path to rapidly drain the spent fuel pool.

APPLICATION OF THE CONCRETE IMPACT EXPERIMENTS TO A SPENT FUEL POOL

- The height used here to evaluate for drops in a spent fuel pool is 9 meters.
- Evaluation of a cask drop should include the buoyancy and drag of the water.
- The impact velocity from a 9 m drop is approximately 12 m/sec, i.e. twice that in the BNFL/AEA 60 in. drop test.
- Hence the damage would be about 4 times that observed in the BNFL/AEA test, i.e. a depression of $4 \times 8 \text{ mm} = 32 \text{ mm}$ (calculated value = 12.5 cm).
- This is much less than half of the pool floor thickness (pool floor thickness ~ 1.5 to 2 m).

Conclusion:

This would not be sufficient to cause "spalling" of the back face of the pool floor (liner strength has not been included). Hence, a cask drop event is much less than that required to cause a failure sufficient to rapidly drain the spent fuel pool.

IMPORTANT EXPERIMENTS CHARACTERIZING Ru FISSION PRODUCT RELEASES

- Oak Ridge Test VI-7 – BWR irradiated fuel segment (6 in.) with Zr cladding – No significant ruthenium release until essentially complete oxidation of the Zircaloy cladding.
- CANDU experiments H02 and H05 – irradiated fuel segment (1 in.) with Zr cladding – No significant ruthenium release until complete oxidation of the cladding.

ANALYTICAL CONSIDERATIONS

- The fuel assembly geometry and the special considerations for a spent fuel pool (boraflex, boral, etc.) influence the natural circulation flowpaths through the pool.
- If a partially drained fuel pool prevents natural circulation through the core, steam is the only significant oxygen source for cladding oxidation. Boildown calculations for this configuration shows that the cladding oxidation would be limited to 10 to 15%, i.e. there would be a large fraction of unreacted cladding.
- BWRs would have more zircaloy than PWRs.
- For those upper regions of the fuel, cladding could melt and drain away from the fuel. However this is limited by:
 - the tight pitch of the fuel pins,
 - melt relocation between the pellet and the cladding,
 - dissolution of the UO_2 by the molten clad, and
 - freezing of the molten material as it drains..

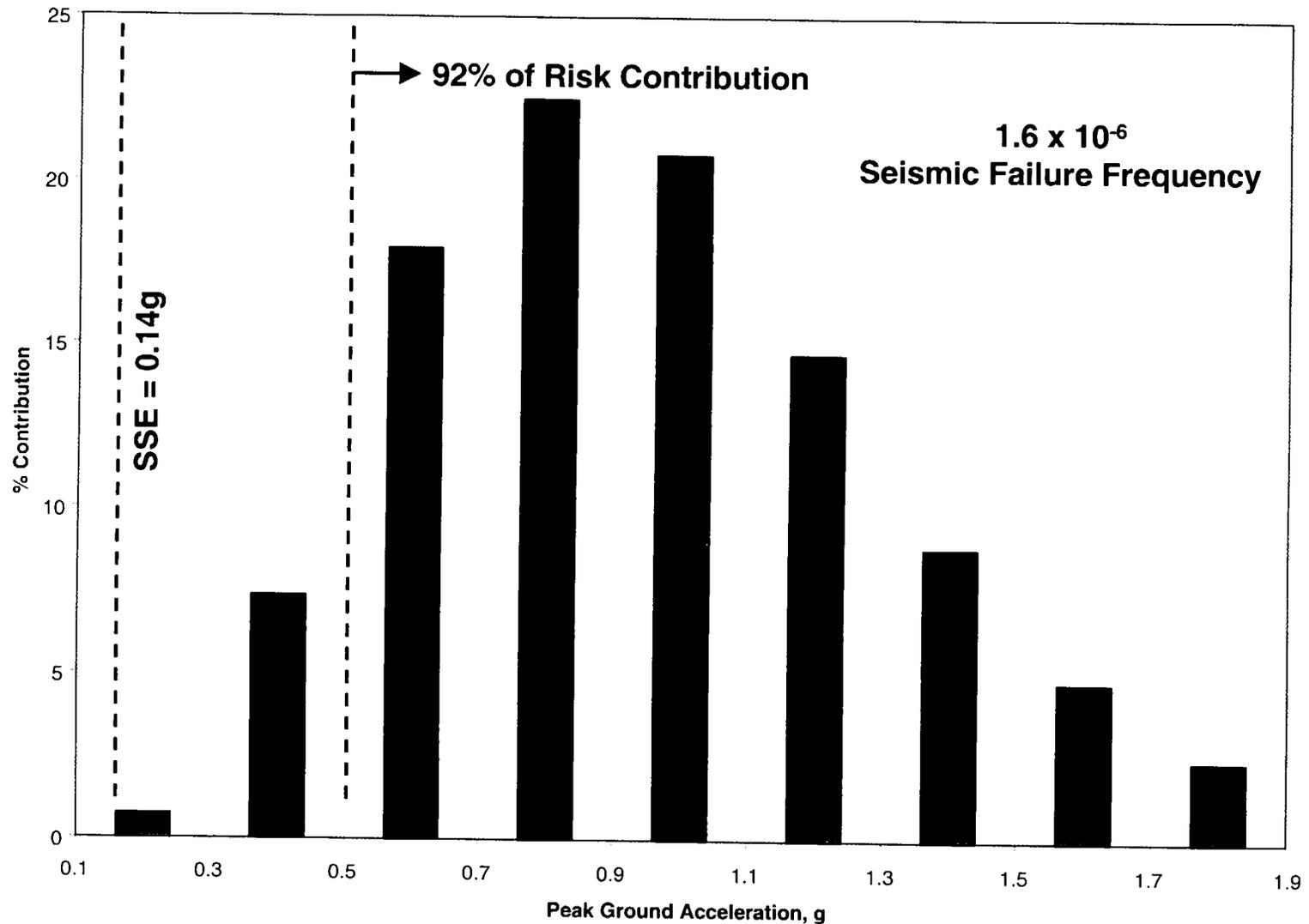
RECOMMENDED EXPANSION OF THE TECHNICAL BASIS

- Provide estimates of the oxidation extent before the fuel slumps
 - CODEX,
 - TMI-2,
 - MELCOR calculations.
- Use the available experiments basis to estimate the Ru releases based on ZrO oxidation and debris temperature
 - ORNL tests (unclad pellets),
 - Chalk River experiments
 - unclad fuel,
 - with fuel cladding.
- Need to consider that some fuel from the top of the pins could be declad (exposed). However, this would also form a particle bed on the upper surface and would be at a lower temperature due to thermal radiation.

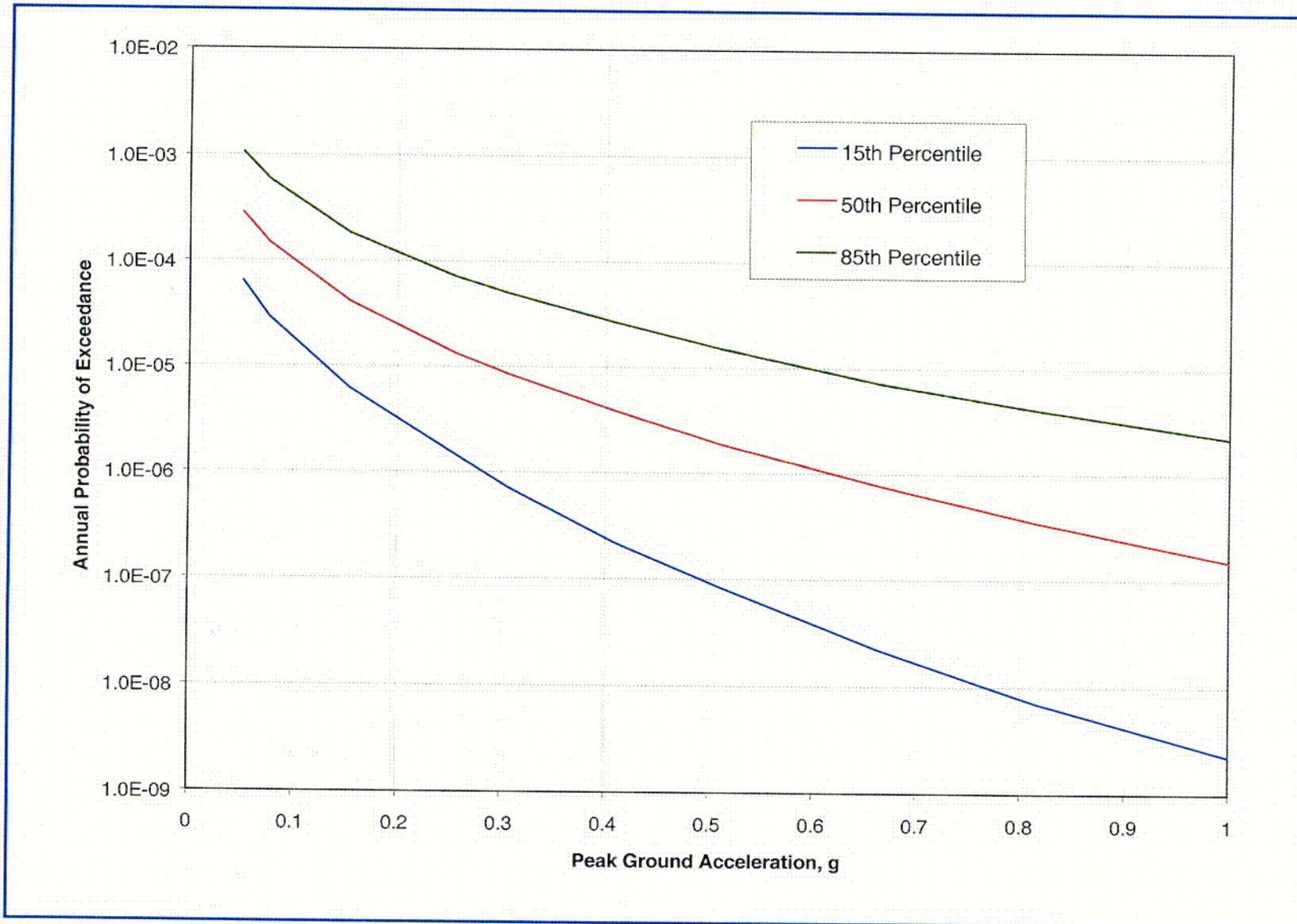
CONCLUSIONS

1. Evaluations for the cask drop events need to incorporate the results of the experiments that have been performed for cask drops as well as other impact loadings on reinforced concrete. A quantitative failure condition should be used to assess the likelihood of such events causing rapid drainage of the spent fuel pool.
2. The risk evaluation should include a representation of a best estimate R_u source term based on the results from radiated fuel with Zircaloy cladding.
3. A peer review is recommended. This is an efficient manner to assure that the relevant experience and experimental insights have been incorporated.

Acceleration Range Contribution to Spent Fuel Pool Structural Failure Probability – Vermont Yankee



Surry Uniform Hazard (PGA)



Industry Observations and Recommendations on Seismic Risk

- Both Deterministic and Probabilistic Seismic Hazard should be considered with respect to any seismic decommissioning regulations
 - Maximum Credible Earthquake Concept should be utilized in this evaluation
 - Tails of random uncertainty term should be truncated at high ground motions
- Earthquake levels which drive the seismic risk should be evaluated for reasonableness
 - Seismic risk comes from extremely large (and correspondingly low probability) earthquakes
 - Increasing the Seismic Capacity (to meet NRC proposed criteria) would translate to redesigning the SFP to an earthquake level several times the SSE

South Texas Project Exemption Request

ACRS Subcommittee Report

**Dr. George Apostolakis
John Sieber**

March 1, 2001

STP Exemption request

- Plant Description, two units, 4 loop W PWR's rated at 1250 MW each.
- Owned by HPL Co, Houston, TX
- Commercial Operation, 1988.
- Three safety trains.
- Lake cooled.
- Large, dry containments.

STP Exemption Request Purpose

- Identify components that are important to safety, from a risk standpoint, and eliminate components not important to safety from the requirements of 10CFR, App B and Special Treatment Requirements.
- Identify non-Q components that are important to safety.

STP Components

(for a 2 Unit Plant)

Total number of components in 29 safety systems.	43,690
Total number of components classified as "Q" components	16,715
Total number of components identified in a typical PRA analysis (2 Units).	2,400

STP Categorization Process

Two Methods were used.

- Re-categorization based on the use of plant specific PRA's. 5.7 percent.
- Re-categorization based on "Expert Panel" elicitation. – 94.3 percent.

STP Categorization Process

Total number of components in 29 systems.	43,690
Total number of components described in typical PRA's (for two units.)	2,400 5.7%
Number of components whose risk contribution must be evaluated by the Expert Panel.	41,290 94.3%

STP Categorization Methodology based on PRA results (5.7%)

<u>PRA Ranking</u>	<u>Criteria</u>
High	RAW \geq 100.0 or FV \geq 0.001 or FV \geq 0.005 and RAW \geq 2.0
Medium - R	FV $<$ 0.005 and RAW between 10 and 100.
Medium	FV \geq 0.005 and RAW $<$ 2.0 or FV $<$ 0.005 and RAW between 2.0 and 10.0
Low	FV $<$ 0.005 and RAW $<$ 2.0

STP Categorization Process

Expert Panel (94.3 %)

- Expert Panel uses Five (5) critical questions.
- Expert Panel ranks each component by the component's sensitivity to frequency of occurrence (demand) and/or perceived risk impact.

STP Categorization Process

Expert Panel Questions

- Does the loss of this function cause an Initiating event?
- Does the loss of this function directly fail another risk significant system?
- Is the function used to mitigate accidents or transients?
- Is this function directly called out in EOP's and ERP's?
- Does this function directly affect safe shutdown or mode changes?

STP Categorization Process

Expert panel – Weighting Factors.

- For each Function, the Five Questions are asked and a weighting factor is applied to each question.
- Also, for each Function, an additional weighting factor is applied to reflect the presumed frequency of occurrence.

STP Categorization Process

Final Weighting of Expert Panel Results.

- A weighting scale is used to account for the impact or frequency of occurrence of the failure of the function.
- The combination of these factors is used to arrive at a final score, which ultimately determines the risk significance of that component that serves that function.

STP Categorization Process

Final Weighting of Deterministic Scores

<u>Score Range</u>	<u>Risk</u>
0 - 20	Not Risk Significant
21 - 40	Low Risk Significance
41 - 70	Medium Risk Significance
71 - 100	High Risk Significance

STP Exemption Request

ACRS Questions

- When PRA's use CDF and LERF as the criteria, do we get the correct outcomes?
- Are RAW and FV the correct measures of importance of a component, in this context?
- Do the deterministic questions and the weighting factors make sense?

STP Categorization Process Results

Safety Related, Risk Significant components 3,810 (8.7%)	Non-Safety Related, Risk Significant 372 (0.9%)
Safety Related, Non-risk Significant 12,905 (29.5%)	Non-Safety Related, Non-Risk Significant. 26,603 (60.9%)

STP Exemption Request Open Items

Open Items	12
Confirmatory Items	1
Items awaiting RILP approval	4
Remaining Open Items	7



*United States
Nuclear Regulatory Commission*

**Trial Use of Management Directive 6.4,
*Generic Issue Program***

**Harold VanderMolen
Ronald Lloyd**

**Division of Systems Analysis
and Regulatory Effectiveness
Office of Nuclear Regulatory Research**

**480th ACRS Meeting
March 1, 2001**

Status of Reevaluation of the Generic Issue Process

- April 9, 1999:** **Incomplete Draft MD 6.4 Issued for Peer Review**
- April 19, 1999:** **ACRS Recommends the Staff Conduct a Pilot Study to Evaluate the Effectiveness of Using a Draft MD for Implementing the Revised Generic Issue Process Prior to Developing a Final Version of MD 6.4 and its Associated Handbook**
- July 21, 1999:** **Issued a Complete Version of the Draft MD**
- October 21, 1999:** **Revision 1 to the Draft MD Issued to Address OGC Comment Clarifying Its Nature and Purpose**
- March 1, 2001:** **(1) Provide an Update to the ACRS Concerning Lessons Learned During the Trial Use of MD 6.4 in Addressing Candidate Reactor and Materials Generic Issues, and
(2) Request Approval to Revise the Draft MD and Issue a Final MD**

Comparison of Draft MD and RES Office Letter Generic Issue Processes

Draft Management Directive 6.4	RES Office Letter No. 7
1. Identification 2. Initial Screening 3. Technical Screening 4. Technical Assessment 5. Regulation and Guidance Development 6. Regulation and Guidance Issuance 7. Implementation, and 8. Verification	1. Identification 2. Prioritization 3. Resolution

Generic Issue Processing Using Draft MD 6.4

Type	Title	Lead Office	Date Initiated	Current Status
Reactor	<i>Potential Risk and Consequences of Heavy Load Drops in Nuclear Power Plants (GI-186)</i>	RES	5/1999	Technical Screening Ongoing
Reactor	<i>Potential Impact of Postulated Cesium Concentration on Equipment Qualification in the Containment Sump (GI-187)</i>	RES	12/1999	Initial Screening Ongoing
Reactor	<i>Steam Generator Tube Leaks/Ruptures Concurrent With Containment Bypass (GI-188)</i>	RES	6/2000	Initial Screening Ongoing
Materials	<i>Leaking Pools (i.e., BWX Technologies, wet storage irradiators, ISFSIs, others containing radioactive materials)</i>	NMSS	10/2000	Dropped (1/26/2001)
Materials	<i>Unlikely Events (inappropriate use of “unlikely events” in support of the double contingency principle of ANSI/ANS- 8.1-1983, “Nuclear Criticality Safety in Operations with Fissionable Materials Outside Reactors”)</i>	NMSS	10/2000	Dropped (1/26/2001)
Materials	<i>Gamma Stereotactic Radiosurgery (Misadministrations, NMSS-0020)</i>	NMSS	10/2000	Dropped (2/12/2001)

Control Candidate Generic Safety Issue

- **For Comparison with MD 6.4, GI-185 *Control of Recriticality Following Small-break LOCAs in PWRs* Was Screened Using the “Old” Generic Safety Issue Process (RES Office Letter No. 7: *Procedures for Identification, Prioritization, Resolution, and Tracking of Generic Issues*)**

MD 6.4 Trial Period Experience:

Candidate Reactor Generic Safety Issues:

- **GI-186** *Potential Risk and Consequences of Heavy Load Drops in Nuclear Power Plants (Now in Technical Screening Stage)*
 - Panel Met Successfully and Determined That the Issue Would Be Classified as a “Compliance Issue” and Dropped
 - NRR Requested That the Risk Significance of the Issue Be Reviewed More In-depth
 - NRR Became Concerned about the Number of Staff Hours Being Consumed to Support Panel Meetings
 - RES Visited Eight Facilities to Obtain Operating Experience Data and Load Drop Studies

- **GI-187** *Potential Impact of Postulated Cesium Concentration on Equipment Qualification in the Containment Sump (Now in Initial Screening Stage)*
 - Difficulty Encountered in Arranging Panel Meetings
 - Panel Agreed on the Conclusion to Drop the Issue, but Disagreed on Specifics of Justifying the Conclusion

MD 6.4 Trial Period Experience (Continued):

Candidate Reactor Generic Safety Issues (Continued):

- **GI-188 *Resonance Vibrations of Steam Generator Tubes Following MSLB Event*
(Now in Initial Screening Stage)**
 - **Technically, a Very Complex Issue Involving a Spectrum of Disciplines**
 - **Difficult to Get an Expert Panel Together**
 - **Delays Occurred Due to Unavailability of the Staff Member Who Raised the Issue**
 - **Significant Amount of Briefing Material**

MD 6.4 Trial Period Experience (Continued):

Control Issue Processed under the “Old” System:

- **GI-185 *Control of Recriticality following Small-Break LOCAs in PWRs***
 - **A Complex Technical Issue Requiring an In-depth Review**
 - **Prioritization Completed in Six Weeks, but Concurrence Review Lasted 197 Days**

MD 6.4 Trial Period Experience (Continued):

Candidate Materials Generic Safety Issues:

- **No Candidate-specific Generic Safety Issue Comments**
- **All Three Candidate Issues Were Dropped Following Panel Review**
- **General MD 6.4 Comments Have Been Included in the Summary Observation Slide**

Summary Observations During Trial Use of Draft MD 6.4

Positive Draft Process Observations:

- **Opportunity to Save Staff Resources for Those Issues That Are Clearly of Low Risk Significance and Are Dropped from the Generic Issue Program**
- **Opportunity to Save Staff Resources for Compliance Issues**
- **Formality of the Process Gives it Visibility at All Levels**
- **Flexibility in Use of Handbook Guidance Especially Useful**
- **Generic Issue Processing Time May Be Shortened by Eliminating Unnecessary Analysis**
- **Consensus on Scope of the Candidate Generic Issue Achieved Early in the Process**

Summary Observations During Trial Use of Draft MD 6.4 (Continued)

Shortcomings and Limitations in Process:

- **In Some Instances, the Panel Concept Has Been Administratively Cumbersome**
- **Initial Screening Stage May Not Provide Sufficient Technical Basis for Decisionmaking**
- **Threshold for Processing Candidate Issues Not Clearly Defined for Materials Issues**
- **Documentation of “Closed” Issues for Materials Issues Could Be Enhanced**
- **A Clear Link Between MD 6.4 and GIMCS Needs to Be Established**

Summary Observations During Trial Use of Draft MD 6.4 (Continued)

Administrative Draft Process Observations:

- **Issues Are Often Complex, Resulting in a Significant Amount of Review Time, and Conflicts with Other Priorities**
- **Issues Can Involve Several Disciplines Resulting in a Large Number of Panel Members**
- **Greater Commitment from NRC Staff Will Be Required to Establish Panels, Set Aside Time to Review and Process Candidate Generic Issues in a Timely Manner**
- **Difficult to Establish a Panel and Complete the Initial Screening Stage Within the Required 30 Days**
- **There Is Still a Desire by NRR for a More In-depth Risk-based Evaluation Prior to Dropping an Issue from the Generic Issue Program**
- **Similarly, Those Who must Enforce “Compliance” Issues Have Expressed a Desire for a Risk Assessment**

Other Observations:

- **The Previous Generic Issue Process Did Not Work Well During this Trial Period in Addressing GI-185**

Caution:

- **Lessons Learned Are Not All Inclusive; in That MD 6.4 Guidance Currently Includes 8 Stages, No Candidate Generic Issue Has Been Processed Beyond Stage 3 of the MD**

Recommendations

- **Add Clarifying Information to Appendix A (Candidate Generic Issue Submittal Form) to Better Focus the Generic Issue Review Panel**
- **Clarify the Requirements of the “Initial Screening Stage” to Limit the Scope of the Panel**
- **Combine the Technical Screening and Technical Assessment Stages to Provide a Better Technical Basis for Decisionmaking; OR Combine the Initial Screening and Technical Screening Stages to simplify the process**
- **Provide Clearer Guidance on the Distinction Between “Adequate Protection” and “Substantial Safety Enhancement”**
- **Delay the Generic Issue Classification into “Adequate Protection,” “Substantial Safety Enhancement,” or “Burden Reduction” to the Technical Screening/Assessment Stage when additional technical analysis results are available**

Recommendations (Continued)

- **Threshold Requirements for Processing Candidate Issues Should be Clarified for Materials Issues**
- **Documentation Requirements for “Closed” Issues Should be Enhanced**
- **A Clear Link Between MD 6.4 and GIMCS Should be established**
- **Consider Greater Sharing of Other Forms of “Generic Communication Issues” Between Offices**
- **Clarify the Level of Technical Analysis That Would Be Done Within the Scope of the MD**

Tentative Schedule for Issuance of MD 6.4

- **Make Revisions to MD 6.4 Based on Lessons Learned:** **March 30, 2001**
- **Distribute MD 6.4 for Peer Review Within the Agency:** **April 10, 2001**
- **Notify the EDO Concerning Pilot Study for Generic Issue Program:** **April 10, 2001**
- **Obtain Final Peer Review Comments on MD 6.4:** **May 11, 2001**
- **Issue Final Version of MD 6.4 for Publication:** **June 29, 2001**