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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS (ACRS)

544th MEETING

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THURSDAY,

JULY 11, 2007

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The meeting was convened in Room T-2B3
of Two White Flint North, 11545 Rockville Pike,
Rockville, Maryland, at 8:30 a.m., Dr. William J.
Shack, Chairman, presiding.

MEMBERS PRESENT:

WILLIAM J. SHACK, Chairman

MARIO V. BONACA, Vice Chairman

SAID ABDEL-KHALIK, ACRS Member-At-Large

GEORGE E. APOSTOLAKIS, ACRS Member

J. SAM ARMIJO, ACRS Member

MICHAEL CORRADINI, ACRS Member

THOMAS S. KRESS, ACRS Member

OTTO L. MAYNARD, ACRS Member

DANA A. POWERS, ACRS Member

GRAHAM B. WALLIS, ACRS Member

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1 NRC STAFF PRESENT:
2 SANJOY BANERJEE
3 RICHARD RASMUSSEN
4 RICHARD LAURA
5 MICHAEL JUNGE
6 TONY CERNE
7 RON GARDENER
8 SCOTT NEWBERRY
9 DAVID FISCHER
10 MARK LESSER
11 TED SULLIVAN
12 AL CSONTOS
13 DAVID RUDLAND
14 SCOTT MORRIS
15 BONNIE SCHNITZLER
16 ERASMIA LOIS
17 ALEX KLEIN
18 JOSE IBARRA
19 PHIL QUALLS
20
21 ALSO PRESENT:
22 AMIR SHAHKARAMI
23 GLENN WHITE
24 PAUL GUNTER
25

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I-N-D-E-X

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Adjourn

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

8:30 a.m.

CHAIRMAN SHACK: On the record. The meeting will now come to order. This is first day of the 544th Meeting of the Advisory Committee on Reactor Safeguards. During today's meeting, the Committee will consider the following: Sampling Methodology and Statistical Thresholds for Selecting ITAACs for Inspection; Dissimilar Metal Weld Issues; Activities in the Safeguards and Security Areas; Revisions to Draft Final NUREG-1852, "Demonstrating the Feasibility and Reliability of Operator Manual Actions in Response to Fire;" and "Preparation of the ACRS Reports. A portion of this meeting may be closed to discuss safeguards and security information.

This meeting is being conducted in accordance in with provisions of Federal Advisory Committee Act. Mr. Sam Duraiswamy is the Designated Federal Official for the initial portion of the meeting.

We have received no written comments from members of the public regarding today's session. We have received a request from Mr. Paul Gunter, Nuclear Information Resource Services, for time to make oral statements regarding NUREG-1852.

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1 A transcript of portions of the meeting is
2 being kept and it is requested that the speakers use
3 one of the microphones, identify themselves and speak
4 with sufficient clarity and volume so that they can be
5 readily heard.

6 I will begin with some items of current
7 interest. Mr. Dave Bissett has joined the ACRS staff
8 as a Senior Staff Engineer on July 9, 2007.

9 (Applause.)

10 CHAIRMAN SHACK: Dave received his BA in
11 Physics and an MS in Mechanical Engineering from the
12 University of Connecticut. He began his career with
13 combustion engineering in 1976 working in fuel
14 development.

15 In 1979, he joined the ACRS as one of the
16 original fellows. In addition to working directly
17 with Dr. Paul Schumann, he worked with the
18 subcommittees on PRA, Reactor Fuel, Waterford 3,
19 LaSalle 1 and 2 and St. Onofri 2 and 3. Dave left the
20 ACRS in 1981 to work for the OECD Nuclear Energy
21 Agency for three years. Upon returning in 1984, he
22 joined the Office of Nuclear Regulatory Research where
23 for the past 23 years he has worked on a wide variety
24 of thermal hydraulic matters. Welcome aboard.

25 On July 25, 2007, Mrs. Vicky Murphy joined

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1 the ACRS ACNW staff as the Office's Executive
2 Secretary. Vicky comes from the Office of Nuclear
3 Regulatory Research where she served as the Division
4 Secretary for the Division of Fuel, Engineering and
5 Radiological Research. Prior to working at the NRC,
6 Vicky worked as an Administrative Assistant and
7 Technology Coordinator for the Calvert County Public
8 Schools.

9 Vicky performed her undergraduate studies
10 at Villanova University. Her husband, Martin Murphy,
11 is Chief of the Generic Communications and Power
12 Uprate Branch in NRR DPR. Welcome aboard.

13 (Applause.)

14 CHAIRMAN SHACK: Mr. Mike Junge who has
15 been with the ACRS staff for about 18 months is
16 leaving to join the Office of New Reactors as Chief of
17 the Operator Licensing and Human Performance Branch on
18 July 16, 2007. As a Senior Staff Engineer, he
19 provided outstanding technical support to the
20 Committee in reviewing numerous technical and
21 regulatory matters including several license renewals
22 applications, fire protection issues, operating plant
23 issues, digital I&C matters and human reliability
24 methods. He also made arrangements and provided
25 technical support to the Committee's annual visit to

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1 a nuclear plant and meeting with the NRC regional
2 administrator.

3 Mike's dedication, hard work, attention to
4 details, professionalism, sense of humor, thorough
5 knowledge of regulatory and operating plant issues,
6 willingness to carry heavy workloads, including those
7 not in his area of responsibility, and his outstanding
8 technical support to the Committee are much
9 appreciated. We're just glad he's becoming a branch
10 chief and not a travel agent because everybody
11 remembers the famous trip to TMI.

12 (Laughter.)

13 CHAIRMAN SHACK: Thank you and good luck
14 in your new job.

15 (Applause.)

16 DR. APOSTOLAKIS: Which branch is that,
17 Mike?

18 MR. JUNGE: The bridge? The one the bus
19 ran into?

20 (Laughter.)

21 MR. JUNGE: We know a way now that the bus
22 can make. So I'll be glad to give advice.

23 DR. APOSTOLAKIS: Which branch?

24 MR. JUNGE: Oh, branch.

25 (Off the record comments.)

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1 MR. JUNGE: I was really expecting a
2 comment about the bus running into the bridge.
3 Operator Licensing and Human Performance in New
4 Reactors.

5 DR. APOSTOLAKIS: Human Performance.

6 MR. JUNGE: Why do you think I've been so
7 nice to you the past few days?

8 DR. APOSTOLAKIS: Make sure you use FAR H.

9 CHAIRMAN SHACK: And another note, Dr.
10 Steven Hannauer who served on the ACRS between 1965
11 and 1970, he was the ACRS Chairman in 1969 died on May
12 21, 2007. Sort of one of the grand old man of nuclear
13 energy.

14 DR. APOSTOLAKIS: Very smart guy. Very
15 smart.

16 CHAIRMAN SHACK: Our topic today will be
17 the Sampling Methodology and Statistical Thresholds
18 for Selecting ITAAC and George will be leading us
19 through that.

20 DR. APOSTOLAKIS: No.

21 CHAIRMAN SHACK: No? Mike.

22 DR. CORRADINI: He didn't want to do it.
23 So he gave it to me. I just wanted to give some us
24 some background on this. The purpose of this session
25 is to respond to the May 16, 2007 staff requirements

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1 memo which is associated with the SECY paper entitled
2 "Staff Approach To Verifying the Closure of
3 Inspections, Testing, Analysis and Acceptance Criteria
4 Through A Sample Based Inspection Program."

5 In the SRM, the Commission directed the
6 staff and let me quote this one, "The staff from ACRS
7 should discuss whether it would be feasible for the
8 committee to review the sampling methodology and
9 statistical thresholds and, if so, the scope and
10 timing of the review. An ACRS review should not
11 divert the committee from performing high priority
12 reviews of safety issues pertaining to existing and
13 future nuclear power plants."

14 So prior to a June 2006 full committee
15 presentation on new reactor licensing and
16 construction, the staff provided the ACRS with a
17 technical report on prioritizations of ITAACs. The
18 technical report was prepared by Information Systems
19 Laboratory, ISL, and formed the basis for the SECY
20 paper. They used an analytic hierarchy process, an
21 IHP, to prioritize the ITAAC for inspection.

22 A little more background. Some of the
23 members may recall that on December `03 the ACRS
24 letter on the draft construction and inspection
25 program framework document. In that letter, the

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1 committee made four recommendations, two of which are
2 relevant here today. First, we agree with the staff
3 the use of the statistical sampling to limit the
4 number of required inspections, testing, analysis and
5 acceptance, ITAAC, inspections will valid in only a
6 few areas and, two, we recommend that the number of
7 ITAACs that are subject to minimal inspection be
8 small.

9 So what we propose is to have the staff
10 explain how the ITAAC inspection program fits into
11 this overall construction inspection program. We've
12 asked the staff to get into some details of the
13 sampling selection process, discuss how they group the
14 ITAACs, how they prioritize them, what are the
15 thresholds they are using to decide what to inspect
16 and what to potentially leave go. To remind everybody
17 to date, the staff has prioritized ITAACs for the AP
18 1000, the ABWR and we'll also probably here about
19 results from the staff proposed approach for the
20 future.

21 So finally, I'll turn the meeting over to
22 the staff and Mr. Rasmussen will lead us through this.

23 MR. RASMUSSEN: Thank you very much. My
24 name is Rick Rasmussen. I'm with the Division of
25 Construction Inspection and Operational Programs. I'm

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1 the Branch Chief of the Construction Inspection and
2 Allegations Branch. With me to make this
3 presentation, I have Rich Laura. He's a Team Leader
4 for the Construction Oversight Team. Rich has a long
5 background as a resident inspector and very familiar
6 with various plant operations through his years in the
7 Operations Center.

8 Also supporting us through the development
9 of these products and in this presentation, if
10 necessary, I have Mr. Tony Cerne, Ron Gardener, ex-
11 resident inspectors, who actually lived through the
12 inspection phase. They bring a ton of experience with
13 them and they were also members of the expert panels
14 that did a lot of this work. Also over on the side
15 table is Mr. Scott Newberry from ISL and ISL was
16 instrumental in the paper that supports our
17 methodology. So they're here if we need them.

18 I already presented why we're here, to
19 describe our plans to use a formal decision making
20 process to inform the selection of ITAAC for a sample
21 base inspection. The objectives of the briefing is to
22 describe the staff's approach to inspection and the
23 verification of closure of ITAAC, to describe why
24 prioritization was chosen and to describe how the
25 formal decision method was used.

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1 A quick overview. We're just going to
2 discuss the background, the inspection of ITAAC, the
3 regulatory basis, how the ITAAC were grouped, the
4 inspection prioritization process, our results that
5 came out of that and our conclusions.

6 This is a slide we use to overall describe
7 our program. I could probably talk for an hour on
8 this slide alone, so I won't. The points that I would
9 like to make with regard to this is that ITAAC are
10 just one element of inspection program. As you can
11 see, the blue line in the center that Rich is
12 highlighting, ITAAC inspections are an ongoing process
13 and it begins when the first elements of construction
14 start. The inspection of ITAAC is a series of samples
15 of those activities and we're also talking about being
16 thorough in our sampling of ITAAC on an overall basis,
17 but even within the ITAAC, it's a series of samples.

18 Many of the ITAAC are not at all single-
19 point, inspection-type processes. They're very
20 complex things. The system was installed, tested.
21 The design, any deficiencies were reconciled through
22 their engineering processes and then the ITAAC is
23 closed. So in order for us to inspect those, it's a
24 series of snapshots. Those results are documented in
25 our CIPMs inspection program and at the end when we go

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1 to do these closeouts, we validate the inspection
2 record to make sure we've done the inspection we
3 expected to do and then we can verify closure.

4 DR. BANERJEE: Can you give us an example
5 of some sort of an item which would be subjected to
6 this?

7 MR. RASMUSSEN: Actually, that's coming in
8 about two slides.

9 DR. BANERJEE: Okay.

10 DR. APOSTOLAKIS: What's the difference
11 between assessment?

12 MR. RASMUSSEN: Okay. Assessment, the
13 2505 process is a regional process. We're thinking
14 currently perhaps on a quarterly basis the regions
15 will look at the inspection record, see what kind of
16 findings we're having and decide if we need to expand
17 our samples in any areas either of ITAAC on a global
18 basis. Are we seeing some kind of problems that are
19 generic across all ITAACs like a QA kind of problem?

20 DR. APOSTOLAKIS: So you kind of sit back
21 and look at the information you have.

22 MR. RASMUSSEN: That's right.

23 DR. APOSTOLAKIS: And what kind of
24 conclusions.

25 MR. RASMUSSEN: Correct. It's analogous

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1 to the annual assessments that are currently done in
2 the ROP in terms of the region managing the resources
3 and we're building it into this process so that if
4 we're seeing these trends we can respond in a
5 predictable manner across all the plants that are
6 being built and allocate more researches where they
7 are necessary.

8 DR. CORRADINI: So, an example would be as
9 if you're looking at some weld and you're sampling and
10 something pops up as a generic concern, you might
11 change how you're doing the inspection, etc.

12 MR. RASMUSSEN: That's correct. And then
13 as you'll see the way the sampling prioritization was
14 done, using the information that we already have, we
15 would have an informed way to think about expanding
16 that inspection, which ones to go up next, which are
17 the next most significant. So we're set up to do
18 that.

19 DR. APOSTOLAKIS: Now OMC 2507 is
20 interesting, the vendor activities.

21 MR. RASMUSSEN: Correct. 2507 --

22 DR. APOSTOLAKIS: Right.

23 MR. RASMUSSEN: -- is a new manual chapter
24 that is currently being developed and this is used by
25 our vendor inspection groups when they go out and look

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1 at the activities that are offsite at the various
2 vendors. They can have tied to ITAAC both direct and
3 indirect. At the lefthand of that bar before the
4 licensee has even come in with the application,
5 currently in Japan watching the construction of major
6 components, they can look at the quality assurance
7 program, document those results in our database and
8 then later on when we truly determine where those
9 components are going, we'll be able to track that
10 through our inspection record for the ultimate
11 closeout.

12 DR. APOSTOLAKIS: Did you say you have
13 inspectors in Japan right now?

14 MR. RASMUSSEN: They've made a trip to
15 Japan. They're traveling different places.

16 DR. APOSTOLAKIS: I see. Already.

17 MR. RASMUSSEN: We have two branches
18 devoted to vendor inspection in our division.

19 DR. APOSTOLAKIS: Interesting.

20 CHAIRMAN SHACK: Now some of the ITAAC are
21 not so much construction as they are completion of
22 design. Right?

23 MR. RASMUSSEN: Correct.

24 CHAIRMAN SHACK: Now presumably once you
25 do those once, those will be sort of done.

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1 MR. RASMUSSEN: They will be done in as
2 much as they're applicable. Yes, sir. There will be
3 site specific elements to those.

4 CHAIRMAN SHACK: Site specific. But many
5 of them should be generic once they're completed I
6 would think.

7 MR. RASMUSSEN: And we are hoping so and
8 that's part of our design center approach to
9 completing these. So hopefully we will be able to
10 inspect them thorough once and then on the subsequent
11 units just verify that they didn't deviate and take
12 credit for that.

13 With that, I'll turn it over to Rich to
14 continue.

15 MR. LAURA: Can you go back to that slide?
16 Hi. My name is Rich Laura and I work for Rick. One
17 point on this slide that shows the whole oversight
18 process for construction is that ITAAC is a big
19 element, but there's a number of different activities
20 that go in parallel that make up our oversight. So
21 there are other inspections of non ITAAC activities
22 like QA programs, design translation inspections and
23 it's important to understand that as you go forward
24 and we focus solely on ITAAC that there are other
25 inspection activities all around them, too. Next

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1 slide.

2 DR. MAYNARD: Will you cover kind of how
3 those are integrated? I take it some of these will be
4 performed by the same people. It may be a
5 construction inspection or it may be an ITAAC.

6 MR. LAURA: It's going to take a lot of
7 coordination and scheduling and the region will be
8 heavily involved and, in Headquarters, we're
9 developing a scheduling process of how we're going to
10 get the licensee's schedule and we're going to break
11 it down into fine pieces and then to schedule
12 everything through CIPMs. We have a construction
13 inspection program management system. So it's going
14 to fairly involved and a lot of those activities are
15 in process. We're working on developing them. So
16 it's a good question.

17 Okay. Starting on ITAACs, this slide
18 generally shows what we already know that ITAACs are
19 created by Part 52 rulemaking. It's a list of items
20 that are developed by the applicants and submitted to
21 the NRC for review and approval. We have to-date
22 reviewed and approved the AP 1000 and also the ABWT
23 designs. There are several other designs that may
24 come in at the end of the year and we'll have to
25 evaluate how we're going to approach those. And

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1 really, all that an ITAAC is it just means an
2 important part of construction process has been
3 completed and the licensee has reviewed it and then
4 they're going to send a letter to us saying they're
5 done and they're real important slices of the overall
6 construction that are highlighted and, typically,
7 there are about 500 to 1,000 per design. We'll get
8 into some specific numbers later.\

9 And because of the large number of them,
10 that's where the prioritization becomes an important
11 piece. The NRC has decided that we're going to use a
12 sampling approach generally consistent with how we do
13 other inspections where we go in and try to find the
14 high value, safety-significant issues and inspect
15 those on a sampling basis and then if we find
16 problems, we'll have the ability, as Rick said,
17 through the assessment process to expand that sample.
18 And then in addition to the ITAAC, you still have
19 those other inspections that all go in parallel. Next
20 slide.

21 DR. APOSTOLAKIS: So what will be
22 inspected will be known in advance both to you and the
23 licensee. Right?

24 MR. LAURA: That's something that we're
25 looking at as far as whether or not we would make that

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1 publicly available. But as we --

2 DR. APOSTOLAKIS: But they would have your
3 methodology.

4 MR. LAURA: Yes.

5 DR. APOSTOLAKIS: Presumably, they can
6 figure it out.

7 MR. RASMUSSEN: Presumably, although wioll
8 not necessarily have the exact results of the expert
9 panels.

10 DR. CORRADINI: Nor will they know when
11 you plan to do it. I mean, they will know when the
12 inspectors are coming on site for their variety of
13 activities as Otto was saying, but it's not clear what
14 they might be doing at any one time.

15 MR. RASMUSSEN: That's correct.

16 DR. APOSTOLAKIS: But are there any plans
17 to have maybe also a few randomly selected items to
18 inspect in addition to the results of the methodology?

19 MR. LAURA: One element that we have is
20 the region has some flexibility to do independent
21 inspection if they see fit when they look as family
22 and we're going to get into this in a little bit. But
23 as we look at a family of ITAAC, one of the principles
24 of the process we use is that all ITAAC in that family
25 share a common activity and becomes a basis for

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1 sampling.

2 Now if the region as they look in detail
3 at those, getting ready to inspect, they find here's
4 one that really doesn't fit that, they'd have
5 flexibility to go ahead and include that, inspect it,
6 and that's an independent, random type decision.

7 DR. APOSTOLAKIS: Well, I mean, that
8 brings up another issue. The recommendation, so to
9 speak, of the prioritization that the methodology
10 provides, is that binding? I mean, they have to do it
11 that way or is that a recommendation? Does the region
12 have the flexibility of saying "Yes, you guys are
13 recommending A, B, C, D. I will do A, B, E, F, G
14 because I don't want to do that and I'll do something
15 else"?

16 MR. LAURA: It's a good -- There is some
17 flexibility and really where the flexibility is is
18 within a specific ITAAC it may say "Look at all
19 pressure boundary welds." There may be 500 welds that
20 are in that sample. The region has the flexibility to
21 pick which ones they want to look at. So there's
22 really no way for a licensee to anticipate exactly
23 which welds we're going to inspect.

24 DR. APOSTOLAKIS: I understand that, but
25 also from the perspective of the region.

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1 MR. LAURA: Right.

2 DR. APOSTOLAKIS: They must follow the
3 recommendations or the results of these methodology or
4 they have some flexibility to work around it?

5 MR. LAURA: Well, this is the program and
6 the expectation is that we're going to use it and
7 there's some flexibility and, obviously, they have
8 some economy in the region that they're going to use
9 judgment and as it gets closer to doing it, that would
10 be something they would have evaluate at that time.

11 DR. MAYNARD: I would think that if they
12 were going to not do something that came out of this
13 there would probably have to be some discussion and
14 justification. But both NRR and the region have
15 flexibility to add things at a short notice or no
16 notice.

17 (Off the record comments.)

18 MR. LAURA: Absolutely. That's a good
19 point. This listing of ITAAC that we're going to get
20 to that are targeted is the minimum baseline
21 inspection. So it's the minimum and we have
22 flexibility to do more if we choose to. So thank you.

23 Okay. This slide shows some real examples
24 of ITAAC. I'm not going to run through the details,
25 but essentially, the purpose of the slide is to show

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1 the top one that deals with reactor coolant pump
2 coastdown. That's a pretty focused, straightforward
3 ITAAC. It's easy to understand and under the
4 acceptance criteria, it has even a specific value.

5 Now the next one down on pressure boundary
6 welds referring to the ASME Code Section III, that's
7 a little more complex and takes more effort to
8 interpret what that means and actually develop how
9 we're going to go out and inspect that. So that's a
10 good contrast that all ITAACs aren't created equal.
11 They vary quite a bit.

12 DR. CORRADINI: So just to nail this, the
13 second one as a box is where your sampling may occur
14 because there would be so many welds.

15 MR. LAURA: Right.

16 DR. CORRADINI: The first one be a go
17 check it out and make the vendor's performance data on
18 the reactor coolant pump is what they say it is and it
19 at least meets this level.

20 MR. LAURA: Right. Exactly.

21 DR. CORRADINI: Thank you.

22 MR. LAURA: Next slide. Okay. We felt it
23 was important to have this time line because this is
24 something that the staff has been working for several
25 years and a lot of the work was done back in about mid

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1 2005. That's when Tony and Ron were working with
2 these lists of ITAACs trying to figure out what to do
3 with them and they had some ideas and then decisions
4 were made to bring in a consultant team to help us out
5 to look at how do we prioritize these, what's the best
6 way, and the result of that effort is this green book.
7 And this became -- This book was issued 9/30/05 and
8 then after that, there was a launch of several expert
9 panels and NRC implemented this methodology and the
10 NRC had to decide which aspects we could reasonably
11 and there are some parts of this that we chose that it
12 wouldn't be practical to implement. And the book
13 allows flexibility. There's even a particular note in
14 here that recognizes that just so long as you have, in
15 a sampling process, a set of rules and you stick to
16 those, that it's okay to do it in slightly different
17 ways. That was necessary as we get to the part of
18 showing you want we built.

19 Following the green book, the 2503 is our
20 program document. That tells you in fairly good
21 detail how we plan to inspect ITAACs. We had a
22 briefing next to the ACRS basically just referring
23 that this process was done and giving an update to the
24 ACRS.

25 Earlier this year, we held a public

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1 meeting with NEI and the topic of that was ITAACs,
2 exactly what ITAACs mean and how we plan to review
3 closure of them. Also earlier this year as Rick
4 mentioned, we sent a SECY paper up to the Commission
5 and explained our plan on how we plan to verify
6 closure of ITAAC and also an SRM that's related was
7 sent back down giving us guidance and that's why we're
8 here today. But in essence, the Commission, in that
9 SRM, approved a sampling approach which was good.

10 And we have also recently created a team
11 called "The ITAAC Closure Verification Working Group"
12 and that's where we have representatives from each
13 division in NRO getting together to really get down to
14 the policy issues that we need to iron out as we go
15 forward because what we learned early on is that ITAAC
16 affect everybody. All of the branches have involved
17 in ITAAC and we have to build consensus as we go
18 forward. It does not no good if we develop something
19 and then we find out later the region doesn't agree or
20 the technical groups don't agree. So we're focusing
21 heavily on building consensus so as we go forward we
22 can nail this down and just move forward and not have
23 to come back to it.

24 Okay. This slide is a little bit busy and
25 it talks about implementation of ITAAC and it's not

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1 necessarily in sequence. It's just a listing of
2 different activities.

3 As far as the NRC portion of this slide,
4 NRC will verify closure of 100 percent of ITAAC and
5 we'll do that in two ways. One way is we're going to
6 do direct inspect of a sample and that's what we're
7 going to talk a lot about on later. And for those
8 ITAAC that we don't do direct inspection on, we're
9 going to review the licensee's incoming technical
10 basis in their letter and we're going to make sure
11 that it sounds reasonable and it makes sense. But
12 that will also be an opportunity that if concerns are
13 raised that the staff will have the ability to keep
14 that ITAAC open and follow up on it. So that's the
15 two-prong approach to the 100 percent verification for
16 the NRC aspects.

17 DR. MAYNARD: On your second bullet there,
18 is it expected that they submit closure for each item
19 or wait until they'll all done and submit one overall
20 letter?

21 MR. LAURA: It's expected to be on a
22 routine basis and the exact process was still --
23 That's one of the tasks for our working group. But,
24 obviously, we're going to try to do -- keep them well
25 scheduled and timely so that we don't end up -- We can

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1 minimize that at the end. We don't end up with 80
2 percent of them.

3 DR. MAYNARD: And I would think that would
4 be the way they would be done as they were completed
5 or in groups, at least. That does create kind of an
6 accounting issue.

7 MR. LAURA: Right.

8 DR. MAYNARD: You have to make sure that
9 at the end of it you got letters or you got
10 confirmation, whatever you want.

11 MR. LAURA: Right. And in one of the
12 other bullets there, the second one from the bottom,
13 once we've reviewed an ITAAC and verified its closure,
14 we're going to post it in the *Federal Register*. So
15 it's going to be a very formal process. It's going to
16 take a lot of thought exactly how we do it all and
17 keep it moving efficiently. That's a real challenge.

18 MR. RASMUSSEN: But I think it's important
19 to note that through the nature of ITAAC because they
20 are so encompassing the welds were done per the
21 drawings and then the design reconciliation phase is
22 all tied into this single ITAAC. So it's estimated
23 right now that about 80 percent of the ITAACs will
24 close in the last 20 percent of the construction
25 process which puts the emphasis on our need to do our

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1 inspection sampling of these ITAAC activities in
2 process throughout the construction phase and then use
3 our inspection record to validate that we've done the
4 inspection that we need to at the end or else it will
5 be just a huge bottleneck.

6 MR. LAURA: Okay. This next slide --

7 DR. ARMIJO: Just a quick question on the
8 closure report. The information that you receive on
9 these closure reports, for example on welds, would the
10 licensee submit information on problems that they had
11 including, let's say, rework or weld repairs, other
12 things like that which gives you an indication that
13 ought to augment or increase your inspection? Are
14 you going to have that level of detail?

15 MR. RASMUSSEN: The Part 52 rulemaking was
16 not specific as to the level of detail of those
17 closure letters and the Commission actually directed
18 the staff to work that out with industry through a
19 guidance document type thing and that work is still
20 ongoing.

21 DR. ARMIJO: Okay. So we don't have a
22 firm vision of that yet.

23 DR. MAYNARD: As part of the construction
24 process outside of the ITAAC, the region and other
25 inspectors are going to be inspecting these.

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1 MR. RASMUSSEN: Right.

2 DR. MAYNARD: And there are also reporting
3 requirements that a utility has when they have issues
4 or problems outside the ITAAC process.

5 MR. RASMUSSEN: Right.

6 MR. LAURA: Right, and there's a good
7 example. One of the other non ITAAC activities, we're
8 going to do some pretty major design translation
9 inspections early on to gain confidence in what the
10 applicant, you know, the quality of their work. Those
11 will be a fairly intense inspection of looking at how
12 they took the design and how they translated it down
13 into to the different documents and drawings and that
14 sort of backs up what we do with ITAAC. So we have a
15 multi-pronged approach and that's what we were trying
16 to get at with that busy slide.

17 This slide here on grouping ITAAC,
18 essentially what it's saying is we developed a matrix
19 approach and this matrix is fundamental to everything
20 as we go forward. What the matrix does is it tries to
21 group ITAAC in what we're going to call families and
22 in those families, those ITAACs will have common
23 activities and it turns out that the common activities
24 are the inspection procedures of the processes and
25 programs that will show and we have a diagram of this

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1 that we'll get to. But this is really the basis of
2 the prioritization process. It starts here. And
3 we've developed a matrix for AP 1000, ABWR and each
4 one has its own unique set of ITAAC.

5 I'm going to cover all these points
6 talking on the picture. I just want to mention the
7 last bullet which is really key saying "Observing
8 performance of ITAAC activity within a family provides
9 insights that are applicable to the remainder of the
10 ITAAC in that family." So that's the fundamental
11 premise of our sampling.

12 Okay. This is a picture of the AP 1000
13 ITAAC matrix and --

14 DR. APOSTOLAKIS: Excuse me. Is their
15 methodology prioritized in families or individual
16 ITAAC?

17 MR. LAURA: Individual ITAAC.

18 DR. APOSTOLAKIS: Individual?

19 MR. LAURA: Yes.

20 DR. APOSTOLAKIS: Considered within the
21 family or in the global?

22 MR. LAURA: Global.

23 DR. APOSTOLAKIS: I see. So what's the
24 value of having the family then?

25 MR. LAURA: The value of the family is

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1 let's say you have 20 ITAAC in that family and we have
2 a slide on this coming up and we go through and we
3 calculate that there are five or 20 that exceed our
4 threshold that we're going to talk about and our
5 threshold is 0.4 that we plan on using.

6 DR. APOSTOLAKIS: That means you're going
7 to do something about it.

8 MR. LAURA: Right. That means we're going
9 to inspect those five and those are going to be
10 representative of the 15 that we don't inspect.

11 DR. APOSTOLAKIS: I see. So you're
12 drawing conclusions about the other 15.

13 MR. LAURA: Right. Exactly.

14 CHAIRMAN SHACK: But you are going to do
15 one from each family at least. Right? The minimum.

16 MR. LAURA: Yes, that's true.

17 DR. APOSTOLAKIS: You are what?

18 CHAIRMAN SHACK: They are going to do at
19 least one from each family.

20 (Several speaking at once.)

21 MR. LAURA: Right. And that's the second
22 part of the methodology, the coverage check, our
23 portfolio check. The first step is are there any
24 families that aren't covered because they don't have
25 any ITAAC greater than the threshold and, in fact,

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1 you'll find that there are 17 families like that and
2 we added in 17 ITAAC.

3 DR. APOSTOLAKIS: (Off microphone.) So
4 that's like ***9:04:36

5 DR. KRESS: If you have a family that has
6 63 ITAACs in it and all of them are below your 0.4,
7 are you just going to sample one?

8 MR. LAURA: Well, that --

9 DR. KRESS: Doesn't it depend on how many
10 is in there?

11 MR. LAURA: That's where Region 2 will
12 some flexibility and that would probably be a case
13 where they would probably exercise that and maybe pick
14 a few a more.

15 DR. KRESS: Do you have criteria on how
16 many to pick based on how many are in there and based
17 on the overall value of the ITAAC?

18 MR. LAURA: No, I guess that would be
19 judgment at the time and at the end, I guess, some of
20 what would be important is the amount of resource
21 available to do the inspections especially --

22 DR. KRESS: It seems to me like for
23 consistency at the various regions you would need some
24 guidance on that.

25 MR. LAURA: Yes, we could look at that and

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1 that's a good point. That's --

2 CHAIRMAN SHACK: That's ***9:05:35 of AHP.

3 DR. KRESS: Yes.

4 MR. LAURA: One point regarding --

5 DR. CORRADINI: Can I just interject?

6 MR. LAURA: Sure.

7 DR. CORRADINI: Maybe I assumed this and
8 maybe I'm wrong. So there will be X orders and the X
9 construction projects. So all regions of the NRC will
10 be looking at this.

11 MR. RASMUSSEN: No. That ties into what
12 he was talking about consistency. All of our
13 construction inspection is going to be led out of the
14 Region 2.

15 DR. CORRADINI: Okay. Fine.

16 MR. RASMUSSEN: So that will provide a
17 single point, continuity and consistency, for this
18 process.

19 DR. CORRADINI: Doesn't that partly answer
20 your question, Tom, in terms of consistency? Okay.
21 Thanks.

22 MR. LAURA: If you -- The way the matrix
23 is constructed is if you look at the top row A, B, C,
24 D, E, it talks about as-built inspection, welding,
25 construction testing, operational testing,

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1 qualification criteria, design and fab requirements.
2 Those are all construction programs. So the top
3 columns here are rows. These are actually programs.

4 Now down the rows, the 19 rows, these are
5 construction processes used to build the structures,
6 systems and components and where these intersect,
7 where a row intersects a column, let's say this block
8 here, that's a family and that number there indicates
9 that there are six ITAAC in that family. So that
10 generally how the matrix is constructed. And within
11 that family, they share some common connection that
12 we'll tap into for the prioritization later.

13 DR. KRESS: I think -- Is that matrix, you
14 think, general rather than just specific to AP 1000?
15 Would it apply to the other type of reactors?

16 MR. LAURA: Well, the shell of it would
17 but not the specific ITAACs.

18 DR. KRESS: That's cool. But the
19 categories are. Right?

20 MR. LAURA: Yes, that's true.

21 DR. CORRADINI: So this matrix, I mean, I
22 was reading this in the, I guess it's the ISO
23 document, is by activity. So the reason they fall
24 into your Box 6 and by construction testing is that
25 the activity requires that somebody has to go onsite

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1 and see what's happened during the construction. In
2 difference to one, they're going to look at some as-
3 built -- They are going to inspect some as-built or in
4 difference to F where they're going to look at some
5 design report or fab report.

6 MR. LAURA: Right.

7 DR. CORRADINI: So it's an activity
8 sampling with area sampling.

9 MR. LAURA: Right, and actually the ITAAC,
10 they're very focused in a sense, but yet when the
11 inspector goes out to inspect that, he's going to be
12 looking using two different procedures. He's going to
13 be looking at that program procedure and then the
14 process procedure and he's going to be looking more
15 broadly. So really each ITAAC that's inspected will
16 give you more confidence as you're looking at other
17 things when the inspector is out there.

18 DR. APOSTOLAKIS: So if we look at Rows 6
19 and 7.

20 MR. LAURA: Okay.

21 DR. APOSTOLAKIS: Why are valves separate?
22 Aren't they mechanical components?

23 MR. LAURA: I guess the way it was done is
24 you could only count when you sorted through all the
25 ITAAC you could only put them one block. So there are

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1 some instances where judgment was needed to put it in
2 the most appropriate place.

3 DR. APOSTOLAKIS: And pumps are not
4 separate? Or I don't see any.

5 MR. LAURA: No.

6 DR. APOSTOLAKIS: Yes. But why --

7 MR. LAURA: Tony, do you want to add
8 something on this?

9 MR. CERNE: Yes. The way this was
10 structured was to get a maximum spread so we didn't
11 have matrix blocks with 100 items in them. So when we
12 were looking at this, we saw there were a lot of
13 actual valve inspection activities, valve installation
14 activities. So we broke them out from the mechanical
15 components. So all your other mechanical components
16 like heat exchangers and pumps, steam generators,
17 whatever are in the mechanical components process
18 block, but the valves were broken out separately
19 because there were sufficient number of ITAAC to
20 justify them as a separate category. Otherwise, you
21 could just take the valves and move them into
22 mechanical components and that would just add the two
23 numbers together which doesn't give you the spread you
24 want when you're going your sampling.

25 DR. APOSTOLAKIS: So again, just for my

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1 own benefit, let's look at valves. It says,
2 "Operational test..." Well, I understand.
3 "Construction testing six ITAACs" and then "design
4 fabrication requirements 20." What -- And "as-built
5 inspection eight." Can you give me an example of
6 these?

7 MR. CERNE: For example, the valve
8 construction test may be an ITAAC that are basically
9 inserts a signal and you're doing a continuity check
10 that upon the insertion of an electrical signal, the
11 valve operates, either opens or closes to the right
12 position. A fabrication erection or fabrication
13 design kind of requirement for a valve might have
14 something to do with some specific fabrication detail
15 in the pressure boundary requirements for the ASME
16 Code or other things that go into the vendor
17 inspection of the valve. It's not a single test after
18 the valve has been installed and you're looking at it.
19 You're looking more at the actual installation and
20 design requirements and that's the way these different
21 definitions were divided up in a way to get some kind
22 of spread of the entire population of ITAAC but also
23 get discrete samples that were common and the same is
24 true for the other requirements. The ASME requirement
25 of the valve may be just something simple. There are

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1 tests that say "Go out and check that these kind of
2 check valves are different than the other kind of
3 check valves." Well, that's a simple, as-built ITAAC
4 inspection requirement. Thank you.

5 Moving to the next --

6 DR. ABDEL-KHALIK: Not all intersections
7 will obviously logically have a family in them.

8 MR. LAURA: True.

9 DR. ABDEL-KHALIK: Some of those boxes
10 will be empty always.

11 MR. LAURA: True.

12 DR. ABDEL-KHALIK: So what is the minimum
13 number -- What is the maximum number of families in
14 this diagram?

15 MR. LAURA: Do you know the total number
16 offhand?

17 MR. CERNE: Well, it's obviously 6 X 19
18 which is -- But you're question is more focused on
19 that. What we've found is -- Again, the question
20 earlier was the matrix is going to be used for all
21 designs. So some of the blocks that don't have
22 anything in it for the ABWR and AP 1000 may have ITAAC
23 for the future designs.

24 DR. ABDEL-KHALIK: There are some boxes
25 that will always be empty.

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1 MR. CERNE: And there will be some boxes
2 that may always be empty and for the designs we have,
3 we're roughly getting in the 70 to 80 range for the
4 blocks that are filled.

5 DR. ABDEL-KHALIK: I'm just trying to
6 block out the ones that will always be empty to find
7 out what is the maximum number of boxes that one can
8 possibly -- You talk about welding of electrical
9 cable. I don't know if that will ever have an item in
10 it.

11 DR. ARMIJO: Or welding of security.

12 MR. LAURA: Right.

13 DR. ABDEL-KHALIK: Or whatever. Based on
14 that I want to find out what is the maximum size of
15 the sample if you have a certain, if you have a
16 minimum of one item per family. That's why I'm asking
17 the question.

18 MR. RASMUSSEN: If you have a minimum of
19 one item per family, we would sample that one item.

20 DR. ABDEL-KHALIK: Right. I understand.
21 But how many of these will always be empty?

22 MR. LAURA: We'd have to tally that up. We
23 don't know that right offhand, but the construction of
24 the matrix is the best fit. It's not absolute perfect
25 in every way and you're pointing that there might be

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1 some blocks that remain empty and that's true. But
2 it's our best effort and our judgment that wanted to
3 sort them this way and this is what we built our
4 processes on because it seemed to follow that. If you
5 look at the ITAAC within the families, they share that
6 common activity. So that seemed to be the logical way
7 to build the matrix.

8 PARTICIPANT: One more thing. I think
9 what we were looking for at the end was there enough
10 diversity, was there enough diverse numbers of blocks
11 that we could feel that any design could be
12 accommodated by this matrix and that's the way we
13 ended up. Every time we look at it, we say what
14 representation do we have across the 114 potential
15 families that is it sufficient that we feel like we
16 have a sufficient spread that our sampling will be
17 sufficient and the process will be aptly applied. And
18 in this case, while you can point out some cases where
19 cable with welding, those are points that obviously
20 could happen. It doesn't affect the fact that our
21 sampling is robust and the fact that our sampling
22 methodology is --

23 MR. CERNE: And one additional point just
24 to explain why the matrix was created, it wasn't
25 created only for the purpose of sampling. It also

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1 gives you the universe of actual construction
2 activities that we want to inspect. So, for example,
3 if you look at your electric cable, we want to inspect
4 that. That's why there will be procedure 09 that
5 inspect electrical cable and there will be B procedure
6 which inspects welding. If there is not electrical
7 cable welding, we're not inspecting that intersection,
8 but we're still inspecting that process and that
9 program.

10 DR. ARMIJO: I noticed you didn't have
11 anything under emergency planning for this particular
12 one. Are there ITAACs for other systems that have
13 emergency planning?

14 MR. RASMUSSEN: Yes.

15 DR. ARMIJO: There's nothing in this.

16 DR. CORRADINI: I seem to remember there
17 was.

18 MR. RASMUSSEN: And those come under as-
19 built. The facilities would be inspected for as-built
20 although they support emergency planning and an
21 important point of this is this table provided focus
22 for this prioritization process. It allows the
23 regions to come up with a methodology for inspecting
24 at the family level that's going to be very useful
25 going forward. But it's not intended to restrict the

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1 inspectors to only looking at the topics of the
2 intersection. As they go out and get into those
3 items, part of the program is the inspectors using
4 every tool in the toolbox that is relevant to whatever
5 situation because the real life situations don't fall
6 directly in those boxes.

7 PARTICIPANT: One more point, too, and
8 that is that this represents -- what you see on that
9 table represented the design certified ITAAC. There
10 will be we're estimating 50, 60. It's just an
11 estimate of site-specific ITAAC that will deal with
12 such things as EP or ultimate heat sink, things like
13 that which are not generic in nature but are site-
14 specific and they will be coming in with the COL.

15 DR. BANERJEE: I suppose the important
16 point is in each box there must be items with rather
17 similar attributes. Right?

18 DR. CORRADINI: Activities.

19 MR. LAURA: True.

20 DR. BANERJEE: That's the basis of this
21 sampling procedure.

22 MR. LAURA: Exactly.

23 DR. APOSTOLAKIS: So one can extrapolate
24 these sides --

25 DR. BANERJEE: Or interpolate, yes.

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1 DR. APOSTOLAKIS: -- a limited number of
2 inspections to the rest of the family.

3 MR. RASMUSSEN: Right.

4 MR. LAURA: Okay. Moving on --

5 DR. APOSTOLAKIS: This all was done
6 randomly before. Right?

7 MR. LAURA: Yes. Well, before they didn't
8 have specific ITAAC and talking to Tony and Ron, what
9 they indicated was inspections were done more in a
10 random way, more of a scheduling. Inspectors would
11 show up onsite on a certain week and they would go out
12 and inspect at random whatever was in process at that
13 time. So that was a different approach and they would
14 try to make it performance-based and select the best
15 you could during that week. But it wasn't as sharply
16 focused as what we were trying to accomplish here and
17 actually this will be much more challenging because we
18 would have to schedule to have inspectors out there to
19 see exact, specific points, where before that might
20 not have been the case.

21 DR. APOSTOLAKIS: Does this save
22 resources?

23 MR. LAURA: We're looking at resources and
24 trying to determine how much resource the baseline
25 will take. But I think the rough talk that we're

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1 hearing is that it's roughly in the same ball park.

2 MR. RASMUSSEN: But this process isn't
3 necessitated by the premise of the Part 52 rulemaking
4 and the fact that the Commission ultimately has to
5 find that these ITAAC have been completed in order to
6 allow these units to operate.

7 DR. MAYNARD: A big different is that in
8 the past you didn't get a license to operate until you
9 were done. This process really gives you a license up
10 front as long as you do these things. There's a major
11 difference there.

12 MR. RASMUSSEN: That's the difference and
13 that's why a more -- The groundwork has to be laid
14 through this process.

15 DR. APOSTOLAKIS: There's a major
16 difference --

17 DR. CORRADINI: This is the QA --

18 DR. APOSTOLAKIS: What is the consequences
19 of that difference?

20 DR. CORRADINI: If they don't satisfy.

21 DR. APOSTOLAKIS: Does anybody save any
22 money or --

23 DR. CORRADINI: But they don't satisfy.

24 DR. APOSTOLAKIS: No, the fact that they
25 have the license in advance.

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1 DR. MAYNARD: Well, from the licensee's
2 standpoint, in the past you could put a lot of money
3 in and do everything you said you were going to do and
4 you still may not get a license. This way you know up
5 front whether you're going to be able to operate it as
6 long as you do --

7 DR. CORRADINI: Do what you say you're
8 going to do.

9 DR. BANERJEE: If you're an investor,
10 George, you would want to be sure this thing has a
11 license before you --

12 DR. APOSTOLAKIS: But I mean still at the
13 end, the Commission has to accept the ITAAC results.

14 (Off the record comments.)

15 DR. APOSTOLAKIS: They can stop at the
16 end.

17 MR. RASMUSSEN: The subjectivity though is
18 done up front.

19 DR. APOSTOLAKIS: I agree.

20 MR. RASMUSSEN: The criteria are already
21 laid out.

22 DR. APOSTOLAKIS: It's a more structured
23 approach. No question about that.

24 DR. ABDEL-KHALIK: Presumably, this would
25 give the Commission a higher level of confidence in

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1 the fidelity of the inspections.

2 DR. APOSTOLAKIS: And I agree with that.

3 DR. ABDEL-KHALIK: Versus the random
4 process that was used in the past.

5 DR. APOSTOLAKIS: I think this is better
6 that way. Fine.

7 MR. LAURA: That's a good point and I
8 think that the folks that have done actual
9 construction inspection feel that way that this is a
10 much more focused, better way of doing it looking at
11 more important activities.

12 DR. BANERJEE: But is there a way that the
13 licensee can actually work out what is going to be
14 inspected and things?

15 DR. APOSTOLAKIS: Sure.

16 DR. BANERJEE: So in a way, the things
17 that you're not going to inspect in order to be done
18 quite so well --

19 MR. LAURA: Well, you have to go back --

20 DR. BANERJEE: The randomized thing would
21 take care of that.

22 MR. LAURA: Within each ITAAC though,
23 again, you get back to there may be hundreds of
24 components that one ITAAC touches. They don't know
25 which sample we're going to look at and also if you go

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1 back to that first slide with all the manual chapters
2 in parallel, there's a number of other activities as
3 part of our oversight that cuts across this as well,
4 just not as sharply as the ITAAC, and that's a real
5 critical point and that's why that slide is really
6 critical that they're supporting process inspections
7 and program inspections that are done separate from
8 ITAAC.

9 DR. BANERJEE: So you feel comfortable
10 that there isn't a way to game this process.

11 MR. LAURA: We feel very confident that
12 there are enough variables and enough activities going
13 on as they're trying to build the plant and with the
14 little element of independence that we have in the
15 region level that they can't game the system.

16 DR. MAYNARD: It's very difficult in a
17 large project to use different standards in different
18 areas based on what you think is going to be
19 inspected. It becomes unmanageable.

20 MR. LAURA: Right.

21 DR. MAYNARD: And it still is going to be
22 a little bit of a moving target. It's not going to be
23 something that you know for sure this is all you're
24 going to be looked at. And I think in the past even
25 in unannounced inspections, we used to try to do more

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1 of those, you find that you really can't change things
2 that much to influence it. I think you'll still be
3 able to get a good look at what's going on.

4 MR. RASMUSSEN: I would also contend that
5 the inspectors onsite were planning a crew of about
6 five resident inspectors onsite through the
7 construction process. When they're out there day in
8 and day out, the ITAAC numbers are not stamped on
9 these components as they're working them. So they
10 will walk up and engage on things and then realize
11 that it was a low priority thing and move on. But
12 they will still see those activities.

13 DR. MAYNARD: And the workers get pretty
14 vocal. I mean, the workers, if they see some gaming
15 going on, it's going to come forward. It's not going
16 to be something you can hide.

17 MR. LAURA: Okay. Thanks. Moving on to
18 the prioritization process, the first step is really
19 rank ordering of ITAAC and this is an overview slide
20 and I'm going to talk about each step in more detail
21 in later slides. The vision is the first bullet.
22 Rank ordering of ITAAC inspection was based on
23 attributes and associated ITAAC impact that make one
24 ITAAC more or less important to inspect based on
25 optimizing resources to minimize the possibility of a

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1 significant flaw going undetected.

2 DR. KRESS: Let me ask you about that
3 point.

4 MR. LAURA: Okay.

5 DR. KRESS: Just plot in your mind the
6 possibility of a significant fault going undetected
7 versus resources which I'll make that number of
8 inspections. I can't see that that has a minimum in
9 it. It seems like it's just sort of continuously
10 going down. I don't see how you -- When you optimize
11 them, I'm looking for minimum in that curve.

12 MR. LAURA: Well, as we get into the
13 attributes in the following slides, those are really
14 critical what attributes of an ITAAC is important to
15 look at and we get into such things of propensity of
16 error. Also we get into how the flaw or error could
17 get revealed. How easy is it to identify that
18 problem? So as we move on, I think there might be
19 some attributes that address that.

20 And again, this is just an overview before
21 we delve a little lower into theory and utility
22 factors. Step 1 was to deliver the attributes of the
23 ITAAC that were important for construction and they
24 came up with five attributes: safety significance,
25 there's no surprise there; propensity for making

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1 errors; construction and testing experience;
2 opportunity to verify by other means; and licensee
3 oversight. So those are the five attributes that were
4 developed by the ISL team and the expert panels that
5 were important.

6 DR. APOSTOLAKIS: Now, in some other
7 applications of this approach, what the methodology
8 does is it comes up with a ranking of things based on
9 tradeoffs among these attributes.

10 MR. LAURA: True.

11 DR. APOSTOLAKIS: But one might say that
12 there are certain ITAACs that are safety significant
13 that I really don't want to do any tradeoffs. I want
14 to do them anyway.

15 MR. LAURA: Right. But --

16 DR. APOSTOLAKIS: And I was wondering
17 whether that would be appropriate. I gave you the
18 example yesterday.

19 MR. LAURA: Right.

20 DR. APOSTOLAKIS: We have our Department
21 of Facilities at MIT is using this to prioritize
22 infrastructure renewal projects and when they were
23 developing it, they said "Look. If one of these
24 projects, if the president of MIT wants to do it,
25 we'll do it. We're not going to optimize anything."

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1 Okay. So in this case, safety plays that role.

2 MR. LAURA: True.

3 DR. APOSTOLAKIS: But are there any ITAACs
4 that because of their safety significance, if they
5 have to be done anyway and forget about propensity of
6 errors and so on -- Now yesterday, you said that the
7 methodology will catch them anyway. But maybe for the
8 --

9 MR. LAURA: Right. I think in the next
10 few slides we're going to touch right on that and I
11 think where we're leading to safety significance
12 dominates and that we're confident that using that
13 waiting factor that we have identified all of the
14 ITAAC, the most important ones, to inspect.

15 DR. APOSTOLAKIS: So even if one does this
16 tradeoff analysis, still the important ones from the
17 safety perspective will be --

18 MR. LAURA: Right.

19 DR. APOSTOLAKIS: That's --

20 PARTICIPANT: That's one of the things we
21 did when we ended up with a prioritization was to go
22 back and see if it encompasses issues like that. Did
23 we have a really high safety significant issue that
24 for some other reason because of the other attributes
25 ended up not being recognized as being important for

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1 us to inspect and the answer was no, there's none like
2 that.

3 DR. APOSTOLAKIS: That's good to know.

4 DR. CORRADINI: I'm sorry. I was just
5 going to ask it a different way just to get to your
6 response. So in other words, if you went through your
7 summation of waiting times, whatever it was, and you
8 set the waiting to zero of the other three and then
9 look back at how you sample, you're saying you'd come
10 up with essentially the same list to inspect.

11 PARTICIPANT: No, because your variations
12 in safety cover a scale and so I thought what he was
13 talking about was the ultimate safety one.

14 DR. CORRADINI: Okay.

15 PARTICIPANT: And that's what we were
16 talking about an extreme safety issue.

17 DR. APOSTOLAKIS: You don't want to have
18 a situation where one ITAAC is very, very important to
19 safety but because of the other attributes it was --

20 PARTICIPANT: Right.

21 DR. APOSTOLAKIS: They are saying yes.
22 Even if that happens, it will be just a little bit.
23 It will still be --

24 PARTICIPANT: Right.

25 MR. LAURA: What might help --

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1 DR. APOSTOLAKIS: The threshold is low.

2 DR. BANERJEE: I think if you go through
3 the details of the procedure it becomes clear.

4 MR. LAURA: Right.

5 DR. APOSTOLAKIS: By the way, this is how
6 we rate --

7 MR. KAUFMAN: This is how we judge the
8 research quality. Right?

9 DR. APOSTOLAKIS: The ACRS does this to
10 evaluate the quality of research progress more or
11 less. The expert panel --

12 MR. LAURA: Okay. Step 2, once we've
13 identified the attributes that are important, Step 2
14 is the NRC formed expert panels staffed with
15 knowledgeable people and they assigned relative
16 weights for each attribute using the AHP process.
17 Then once that was --

18 DR. BANERJEE: What is the AHP process?

19 MR. LAURA: Well, we're going to get into
20 that. So it's some process.

21 MR. LAURA: Right. We're going to get
22 further into it. Then the next step -- It's important
23 to have an overview before we delve right into it
24 because once you get into the theory, it gets a little
25 --

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1 DR. BANERJEE: We can hold on for that.

2 MR. LAURA: Okay.

3 DR. KRESS: Now when it says it assigns
4 relative weights for the attributes, that's unique for
5 each ITAAC.

6 MR. LAURA: No, each -- Well, if you could
7 hold that, we're going to get to that.

8 DR. KRESS: Okay.

9 MR. LAURA: Yes. We keep -- Again, this
10 is an overview and --

11 DR. CORRADINI: Keep on going.

12 MR. LAURA: Okay.

13 DR. APOSTOLAKIS: This is just
14 documentation versus technical content. But then you
15 have to rate it within technical content. That's what
16 you said comes in.

17 MR. LAURA: Okay. Then once the relative
18 weights are assigned, the same expert panel then
19 determined utility values for each attribute.

20 Step 3, a separate expert panel determined
21 utility factors for each attribute for each ITAAC and
22 we have a slide that shows that very clearly. Step 4,
23 the results of all of that --

24 DR. ARMIJO: What do you mean "utility
25 factors"? I don't --

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1 DR. CORRADINI: We're coming to that.

2 MR. LAURA: Yes, it's coming.

3 DR. ARMIJO: That's going to be defined.

4 DR. APOSTOLAKIS: This overview uses too
5 many terms that aren't defined.

6 DR. BANERJEE: But there are two items as
7 I see it which have to be assigned. One is the
8 relative weight and one is something called a utility
9 value.

10 MR. LAURA: True.

11 (Several speaking at once.)

12 DR. APOSTOLAKIS: Let's think in terms of
13 the evaluation of projects. The two attributes that
14 we're using are technical for meeting the objectives
15 and documentation. There is a relative weight and
16 then within each one you say it meets satisfactorily
17 or -- That's a utility.

18 DR. ABDEL-KHALIK: Is there a bigger loop
19 around this process where the results of a prior
20 inspection are fed back to these expert panels so that
21 they may revise the relative weights?

22 MR. LAURA: The members of the expert
23 panels were selected based on having significant
24 construction experience, knowledge of what inspection
25 procedures were used during construction activities

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1 and, you know, would be the right mix of people to
2 determine these weights and they were guided. So
3 guidance was given to the expert panels. They were
4 sort of fostered. In fact, Tony and Ron did some of
5 that.

6 But what I'd like to do now is just move
7 forward because --

8 MR. RASMUSSEN: Let me answer this. On
9 the original drawings that you probably saw in the
10 previous presentations that loop was in there.
11 However, we don't have any data to support that loop
12 and in practice, we've knolled that out so it won't be
13 a player in this process. However, that 2505
14 assessment process that's part of our overall program
15 is going to be our tool for feeding back and informing
16 our inspection resources.

17 DR. CORRADINI: Yes, if something pops up,
18 you're going to use the 2505 procedure to essentially
19 bore down into something that looks fishy essentially.

20 MR. RASMUSSEN: That's correct.

21 DR. CORRADINI: I think you need to move.

22 MR. LAURA: Okay. The last step which is
23 an important step, the results of these previous steps
24 get fed into an algorithm that produces a listing of
25 ITAAC value of inspection results and that's the

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1 actual rank is the value of inspection and we'll show
2 that as well.

3 Here is a little more detail on each of
4 the five attributes. Propensity for making errors is
5 simply how complex, how difficult, is this activity.
6 What's the likelihood that someone would make a
7 mistake or an error.

8 Construction and testing experience
9 generally means is this the first time this has ever
10 been done or is this something that's routine and done
11 all the time or it could mean does the company have
12 little nuclear experience.

13 Opportunity to verify by other means, this
14 means do we have just one shot to find this error or
15 are there multiple opportunities down the road either
16 through testing or other activities that it would come
17 to light.

18 Licensee oversight attention. That
19 related to how effective is the licensee's oversight.

20 And the last one, safety significance, as
21 far as that one, the safety significance was defined
22 by PRA waiting factors which was assigned by a
23 separate expert panel and essentially what was done is
24 all systems were ranked with PRA and then that panel
25 went back and ranked every ITAAC and came up with a

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1 number for each individual ITAAC. So quite a lot of
2 work was done on that particular one. That attribute
3 is a little unique as compared to the others and
4 you'll see how that factors in on the next slide.

5 DR. APOSTOLAKIS: But, now -- wait. Let's
6 go back.

7 DR. BANERJEE: Let's back because of the
8 last point.

9 MR. LAURA: Okay.

10 DR. APOSTOLAKIS: Go back to that slide.
11 When we were reviewing the risk-informed version of
12 5069, they did exactly the same thing there and you
13 can copy that process, although those guys were doing
14 it for an existing reactor and this is for something
15 that is being built.

16 Why PR -- I mean, are you looking only at
17 the structure, systems and components that appear in
18 the PRA? Because if they are not, then the expert
19 panel has to do it using other methods.

20 MR. LAURA: the focus of the expert panel
21 was on the ITAACs. The ITAAC is our focus.

22 DR. APOSTOLAKIS: And ITAACs are only for
23 PRA components?

24 MR. LAURA: No. ITAACs cross boundaries.

25 DR. APOSTOLAKIS: Okay. And the expert

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1 panel, they had real risk experts on it and they
2 looked at the risk information that was submitted to
3 the agency, used our own judgments and they ranked all
4 the systems of the new design and came out with a
5 value for each system.

6 DR. APOSTOLAKIS: I understand that. For
7 the components that appear in the PRA, there's no
8 problem. But the ones that are not and the majority
9 are not, the panel would have to make a judgment
10 without the PRA insight.

11 MR. LAURA: True and that's where safety
12 significance is a little bit different than risk
13 significance.

14 DR. APOSTOLAKIS: Yes.

15 MR. LAURA: That's where there's some
16 engineering judgment.

17 DR. APOSTOLAKIS: Right. Now what are the
18 relative weights that came out of all of this? Do you
19 show them anywhere?

20 MR. LAURA: We have those. It's coming.

21 DR. APOSTOLAKIS: I'm not sure. Yes.

22 MR. LAURA: You're right. It's not there,
23 but I can tell you what they are.

24 DR. APOSTOLAKIS: Can you tell us now?

25 MR. LAURA: If you want to skip the

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1 utility theory.

2 DR. CORRADINI: No, I think we need to do
3 utility theory.

4 MR. LAURA: Okay.

5 DR. APOSTOLAKIS: It's important to
6 understand what we're doing.

7 MR. LAURA: Okay.

8 DR. APOSTOLAKIS: I mean, we have the --

9 MR. LAURA: Okay. If you look at the
10 attributes which starts here and goes across the
11 safety significance. Here are the five attributes and
12 the dominant one is safety significance at 0.33.

13 DR. APOSTOLAKIS: What?

14 MR. LAURA: 0.33. That would be weight of
15 safety significance.

16 DR. APOSTOLAKIS: So you see. It's not
17 there. Right?

18 MR. LAURA: True.

19 DR. APOSTOLAKIS: Okay. So let's back and
20 put it there, 0.33.

21 MR. LAURA: Right. The next one, licensee
22 oversight, that's 0.3. Verified by other means is
23 0.19.

24 DR. APOSTOLAKIS: Okay.

25 MR. LAURA: C&T experience is 0.09 and

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1 error propensity is 0.5. So what you see there is
2 some of these pretty much --

3 DR. APOSTOLAKIS: Do these add up to one?

4 MR. LAURA: More or less.

5 DR. ABDEL-KHALIK: 0.96.

6 DR. APOSTOLAKIS: What?

7 DR. ABDEL-KHALIK: 0.96.

8 DR. BANERJEE: Do they have to add up to
9 one?

10 DR. APOSTOLAKIS: Yes.

11 MR. LAURA: Yes. Licensee --

12 DR. APOSTOLAKIS: Relative weights over
13 exhaustive space. So safety significance and licensee
14 oversight attention were judged to be almost of equal
15 importance.

16 MR. LAURA: True.

17 DR. APOSTOLAKIS: Interesting.

18 MR. LAURA: And there is going to be some
19 follow-up discussion on that that we're going to get
20 to because the item on licensee oversight when we
21 start the project we don't have real experience with
22 that licensee. So initially, that gets nulled with
23 the medium value number.

24 DR. CORRADINI: Okay.

25 MR. LAURA: Okay. If we go back to

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1 utility theory, the approach is to prioritize ITAACs
2 by inspection value and then the next bullet gives a
3 definition of what the utility is. But essentially in
4 my own words, it's the relative importance of each
5 attribute as it's compared to each other. So what it
6 does is it bounces the attributes against each other
7 and how does the expert panel rate them. So at a very
8 high level, that's what it's doing.

9 And also there's a second utility
10 application. When we get to the specific ITAAC and we
11 rate each ITAAC for each attribute, there's a utility
12 figure there as well. So it's easy to get a little
13 confused.

14 DR. BANERJEE: I'm still a little
15 confused. Now you have a weight which is more or less
16 fixed to each attribute.

17 MR. LAURA: True.

18 DR. BANERJEE: Now for each ITAAC now
19 within this, there are these attributes or whatever.

20 MR. LAURA: True.

21 DR. BANERJEE: So clarify again what this
22 utility is.

23 MR. LAURA: What the utility is it's
24 relative importance which means you compare one item
25 against another item.

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1 DR. BANERJEE: Give me a concrete example.

2 MR. RASMUSSEN: Next slide.

3 DR. BANERJEE: The next slide. Let's do
4 it then.

5 MR. LAURA: Okay. This slide shows really
6 some of the details of it and in this column here,
7 these are both AP 1000 ITAACs and one of them, the
8 first one, deals with flow through a drain line from
9 a refueling water storage tank and the second ITAAC
10 deals with seismic qualifications of important
11 buildings which is a big heavy hitter and here are the
12 five attributes and the output of all of this is going
13 to be this number which the algorithm determines which
14 is a value of inspection ranking --

15 DR. BANERJEE: Those twos and threes and
16 so on, are they utility values or what?

17 MR. LAURA: I'm going to get to those.

18 DR. BANERJEE: Okay.

19 MR. LAURA: Actually, yes, they are. But
20 there's not the same utility that we talked about for
21 the attributes. Those have their own utility value
22 and then when we get to this point, you also have a --
23 This B and V are utility values and one is called
24 "baseline" where baseline means the likelihood that an
25 error or problem actually exists. That's baseline and

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1 then the value of inspection or what the green book
2 calls "no flag" that means what confidence does NRC
3 have that if we did not inspect it that it would be
4 okay, that there would be no problem. And then what
5 you do is you subtract the value of inspection from
6 the baseline and that gives you a delta, a delta U,
7 and that delta is the actual value of inspection and
8 that's what we're --

9 DR. APOSTOLAKIS: I think the question was
10 different. If you go back to Slide 13, see, the
11 relative weights that were just given to us tell us
12 how more important is safety significance with respect
13 to opportunity verify by other means. Now given an
14 ITAAC though, you look now at each one of these.
15 Safety significance, how important is that ITAAC to
16 safety? That is not covered by these weights. These
17 are just relative among the applicant.

18 DR. BANERJEE: Yes.

19 DR. APOSTOLAKIS: And they have scale that
20 says one or two or three or four. I don't know. How
21 many steps? How many?

22 DR. CORRADINI: Nine.

23 DR. APOSTOLAKIS: Nine levels. So that's
24 really what the utility does.

25 DR. BANERJEE: That's right.

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1 DR. APOSTOLAKIS: Within each one of the
2 --

3 DR. BANERJEE: It's attached to each
4 ITAAC.

5 DR. APOSTOLAKIS: Exactly. Within each
6 attribute.

7 DR. CORRADINI: So the expert panel
8 basically works through this.

9 DR. BANERJEE: The weights are attached to
10 the attributes and the utilities are attached to the
11 --

12 DR. APOSTOLAKIS: Exactly.

13 DR. CORRADINI: But the second point that
14 I think he makes with the example as important is that
15 they're looking at the delta so that if something has
16 a propensity there's no -- You said it better than I
17 understood it when I read the green book. But
18 basically, it's the delta that determines the final
19 ITAAC rank. For example then, safety significance,
20 although we would worry that at 0.33 it's only one-
21 third of the total thing, it essentially dominates
22 because it's the delta U that essentially determines
23 the final ranking. So --

24 (Several speaking at once.)

25 DR. BANERJEE: V is zero there. Right?

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1 MR. LAURA: I'm going to get to that. But

2 --

3 DR. APOSTOLAKIS: I'm not sure I

4 understand.

5 DR. BANERJEE: What is the V there? What

6 is V for --

7 MR. LAURA: V is -- If you look in the
8 green book, it's called "Utility No Flag" and in
9 English what that means to me or as I've learned it is
10 the value of inspecting. In other words, if we didn't
11 inspect that item, what's the likelihood that there
12 are error or major problems that will exist and not
13 get detected.

14 DR. BANERJEE: So when 2 and 2 is there,
15 what does that mean?

16 MR. LAURA: Okay. I'm going to go through
17 that.

18 DR. BANERJEE: Okay.

19 MR. LAURA: The first three attributes, if
20 you look at error propensity, C&T and verified by
21 other means, they have 2 and those three were treated
22 -- We had both values, the baseline and the value of
23 inspection and that created this delta that drives the
24 value of inspection for those attributes.

25 Licensee oversight, when this was looked

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1 at, the expert panels decided that at the beginning
2 there was not enough information available as you
3 start a project. So they essentially nulled that
4 attribute giving it a 3 score. The scale is 1 to 5.

5 And then the last one safety significance,
6 the safety significance doesn't change between the
7 baseline or value of inspection. So safety
8 significance is treated in a little bit different way
9 and if you look at these numbers, they were scored in
10 these examples very high. Like this one is a 5. A 5
11 out of 5 dominated this computation and gave it 0.65
12 rating which will -- And our threshold is 0.4 and
13 we're going to get to that. So it clearly drove that
14 one that we're going to directly inspect it.

15 DR. APOSTOLAKIS: How does the rank get
16 computed? This is the fundamental question. This
17 0.432, what is it?

18 MR. LAURA: That's an output from an
19 algorithm.

20 DR. APOSTOLAKIS: Yes, given these numbers
21 there, how would I get that?

22 DR. BANERJEE: Are you going to show us
23 the algorithm?

24 MR. LAURA: No. The algorithm, it's a
25 software.

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1 DR. APOSTOLAKIS: I know that.

2 MR. LAURA: Okay.

3 DR. APOSTOLAKIS: But if I have the values
4 you are showing on the row, I should be able to
5 calculate the 0.432 by hand.

6 MR. NEWBERRY: Let me try. Scott
7 Newberry, ISL. It's just the summing of the
8 individual products of the weight, the individual
9 attribute weight, times the utility value for that
10 ITAAC for that attribute. I think you said it
11 yourself. You should be able to do the arithmetic of
12 each of those terms.

13 DR. APOSTOLAKIS: But you -- The thing
14 that's confusing me is that I have a B and a V value.

15 (Several speaking at once.)

16 MR. NEWBERRY: Thank you. You do two
17 computations and then take the difference.

18 DR. APOSTOLAKIS: So I do two
19 computations, one with the B values and one with the
20 V for the first three and the B for the second, for
21 the last two?

22 MR. NEWBERRY: Yes sir. And a comment on
23 that is --

24 DR. ARMIJO: It's B minus V times the
25 weighting factor for each of those.

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1 DR. APOSTOLAKIS: But I don't understand
2 why B-V. Why isn't it just B X W?

3 MR. NEWBERRY: The challenge -- One of the
4 major challenges on the project was to think about and
5 come up with a method for determining the priority of
6 the value of inspecting the ITAAC not the importance
7 of the ITAAC itself. So the B more closely represents
8 the priority of the ITAAC. This V term and the whole
9 concept was invented working with the inspectors to
10 have them think about the information you would get
11 that from that inspection or what you would lose if
12 you don't inspect. So the difference you see there
13 between -- Well, no difference, in fact, on the first
14 one, 2 to 2. That would imply that there's not much
15 value in the inspection at all.

16 As you move to the right, you'll see that
17 the inspectors, the expert panels judged as the
18 difference grows that there is a higher value to
19 looking or inspecting that ITAAC.

20 DR. APOSTOLAKIS: So if we look at
21 verified by other means, a value of 4 for B means that
22 there is a pretty good chance that they will be
23 verified by other means.

24 PARTICIPANT: No, it means that there is
25 a higher likelihood that an error could go undetected

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1 because of the fact there isn't a way to verify. For
2 example, rebar and concrete being placed over it, if
3 you don't take advantage of your chance for
4 inspection, the concrete covers it. There's not
5 another way to inspect it unless you do something
6 highly esoteric. So there is a high likelihood that
7 without another way that there could be an error.

8 So now you look at it and say though is
9 there any confidence that if the NRC doesn't inspect,
10 what's our confidence level without NRC inspection
11 that the licensing or the applicant would do it
12 seamlessly with no issue and the 1 indicates there's
13 low confidence that the issue could be assumed to be
14 okay without NRC inspection. So you have high
15 likelihood or relatively high likelihood 4 and
16 relatively low or actually the lowest confidence that
17 it would be done seamlessly without NRC overview. So
18 you get a 3 delta which is a fairly significant delta
19 which makes that value then applied with the attribute
20 number somewhat higher than by itself. So the deltas
21 actually can control how much weight, with the weight,
22 how much that attribute is valued.

23 DR. CORRADINI: So that's why he said --
24 George, the way I understand, that's why he said that
25 at least in these examples even though we were worried

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1 about the ranking or the equating of safety as being
2 not as high as we'd like, the very fact that as you
3 explained to the inspection, you're essentially
4 weighting everything even more with safety
5 significance and license and oversight. So if you had
6 a licensee that you knew built 17 plants in the last
7 17 years, that might -- But we have very little
8 knowledge. So we would rank both of those quite high
9 which may dominate the total weighting of everything.

10 DR. APOSTOLAKIS: So in the error
11 propensity, a value of 2 under B means that there
12 isn't any much likelihood that they would --

13 PARTICIPANT: That's right.

14 DR. APOSTOLAKIS: And then the value of 2
15 means what?

16 MR. CERNE: The value of inspection gives
17 you a confidence that without NRC interaction or
18 inspection of this issue, it will be done properly.
19 So you could have a value, an error propensity value
20 of 5. In other words, there's high propensity for
21 errors. However, the NRC inspection, there's still
22 high confidence it will be done right and that you
23 could have a 5 there also. So you would still get a
24 delta of 0.

25 A good example of that, the verified by

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1 other means, the concrete was a good example of if you
2 put concrete over the rebar, you're not going to be
3 able to see it. So if you have a high value for
4 concrete for verified by other means and the NRC wants
5 to look at it, our inspection of that rebar adds
6 value.

7 On the other end of the scale, you could
8 take a test which in itself maybe a highly complex
9 test and there might be a high error propensity to it,
10 but what if that test is also going to be a tech spec
11 test which is repeated every quarter and therefore,
12 even though we think it's high error propensity, we
13 also believe that our value of inspecting it at that
14 time isn't quite as great because we know during the
15 life of this plant it's going to be checked every
16 quarter. So it's always the delta that gives you the
17 value of inspection, not the innate value of the
18 ITAAC, but the value of NRC inspection of that ITAAC.

19 MR. LAURA: Okay. Thanks, Tony. The next
20 slide.

21 DR. BANERJEE: Now for safety significance
22 and licensee oversight would effectively be zero
23 there.

24 MR. CERNE: Right. Because licensee
25 oversight was no doubt because we have no doubt at

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1 this point.

2 DR. BANERJEE: So the way your algorithm
3 works is 0.33 multiplied by B plus +3 multiplied by B
4 for the second column, then whatever it is multiplied
5 B-V and so on and you sum it. Is that it?

6 MR. CERNE: That's what we did.

7 DR. CORRADINI: You normalize it.

8 DR. BANERJEE: It's a summation or --

9 DR. APOSTOLAKIS: They take the
10 differences and the weight that sum -- Using the
11 weights they show the --

12 DR. CORRADINI: And normalize. Yes?

13 DR. APOSTOLAKIS: No, it's normalized
14 already.

15 PARTICIPANT: Normalized based on
16 weighting factors.

17 MR. LAURA: Okay.

18 DR. APOSTOLAKIS: The scale is given.
19 It's from 1 to 5.

20 MR. LAURA: This slide shows --

21 DR. APOSTOLAKIS: It will be normalized
22 from 1 to 5.

23 DR. KRESS: Okay. Here's where you do the
24 sanity check. Look at the end --

25 DR. CORRADINI: Or insanity.

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1 (Off the record comments.)

2 MR. LAURA: This slide shows six different
3 families now, specific families with the ITAAC numbers
4 listed in the left column and then their rank of
5 inspection and value. And so to pick an example, if
6 you look at family 6B, welding mechanical components,
7 you have five ITAAC. And then over here you have five
8 different -- or five ranks, one of each ITAAC.

9 Now the threshold that we chose based on
10 judgment and having the proper coverage was 0.4. And
11 we're going to talk about that some more next. But
12 what we would essentially do is draw a line right here
13 on the 0.52 and we would inspect the top three ITAAC
14 in that family and we would not inspect the bottom
15 two. Now if problems were found in the top three,
16 then that changes the ballgame. But if we --
17 Initially going in, we're going to target for direct
18 inspection the ITAAC greater than 0.4.

19 DR. KRESS: Now why did you arrive at 0.4?

20 MR. LAURA: It was judgment and it was a
21 matter of do we have the right coverage looking at all
22 the systems and we did some sensitivity studies as
23 well. What would happen if we used 0.3? How many
24 more ITAAC would get added in? But when you look at
25 those ITAAC that got added in, did they really add

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1 significant value of inspection and the judgment was
2 no. So we felt comfortably that 0.4 was the right
3 threshold.

4 DR. ABDEL-KHALIK: Does that threshold
5 depend on which machine we're talking about or is it
6 universal?

7 MR. LAURA: You mean between designs?

8 DR. ABDEL-KHALIK: Right.

9 MR. LAURA: That's a good question and it
10 turned out for the ABWR, and you're going to see this
11 when we get to that, that the slightly different
12 results, and there's good reasons for those, but we
13 ended up sticking with the same 0.4 for both designs
14 that we've looked at so far.

15 DR. APOSTOLAKIS: Now that's one number
16 you could have kept secret.

17 MR. LAURA: Right. 0.4.

18 MR. RASMUSSEN: But that's a question
19 we're going to have to ask as we do the other designs.

20 DR. ARMIJO: Just your highest value --
21 Can you go backwards?

22 DR. APOSTOLAKIS: Yes, 0.4 is something
23 that you may rethink. Right?

24 MR. LAURA: Right.

25 DR. ARMIJO: Now you have three

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1 significant figures here on something and our highest
2 number on that chart is 0.569 around on mechanical
3 components.

4 DR. APOSTOLAKIS: Where are you looking
5 at, Sam?

6 DR. ARMIJO: I'm just trying to get a
7 scale.

8 DR. APOSTOLAKIS: Yes, but where?

9 DR. ARMIJO: Family 6D.

10 DR. APOSTOLAKIS: Okay.

11 DR. ARMIJO: At the very bottom, 0.569.

12 DR. APOSTOLAKIS: The second column.
13 Bottom of the second column.

14 DR. ARMIJO: There's 0.596 right above it.
15 Is that your highest one? Just tell me what that is
16 compared to -- just so we'll have a feeling that that
17 is the right --

18 MR. LAURA: I don't have -- We'd have to
19 go back and --

20 CHAIRMAN SHACK: You don't memorize them
21 all.

22 MR. LAURA: No. Remember, there's 1,000.

23 (Laughter.)

24 DR. KRESS: Tell us which ITAAC that is.

25 DR. APOSTOLAKIS: Why don't you do that on

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1 slide 15 where you have the description and explain
2 the difference? Slide 15 you actually have the
3 description.

4 MR. LAURA: Right. Slide --

5 DR. APOSTOLAKIS: But why did 3.3.2.a.i
6 come out ahead and the other one barely makes it?

7 MR. LAURA: And that was the point of
8 these examples. The 3.3.2.a.i is the seismic
9 qualification of the buildings, you know, the ones
10 that have been seismic. So that's like central. So
11 that got a very high number. The other one is dealing
12 with the flow rate through a drain line off of a tank
13 and it has some importance, but it doesn't come out as
14 high as all the buildings being seismically qualified.

15 DR. BANERJEE: Why does the safety
16 significance of that drain line go to four? That's
17 pretty high, isn't it?

18 DR. APOSTOLAKIS: That's pretty high.

19 DR. CORRADINI: Wait a minute. Is it
20 drain drying drain line or is this the drain line to
21 the vessel?

22 PARTICIPANT: It's drain line to
23 containment and it's part of the passive core cooling
24 system's ability to cool the outside surface of the
25 reactor vessel under severe accident conditions.

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1 DR. CORRADINI: It's important. It's not
2 your normal drain line.

3 DR. ARMIJO: It's a good, very important
4 drain line.

5 MR. LAURA: The last step of this is to
6 call the portfolio perspective or coverage check and
7 we've already touched on this essentially saying that
8 any families that have ITAAC and none of those are
9 greater than the 0.4 threshold, in order to stay
10 honest and true to the principles of sampling, we're
11 going to add in one ITAAC for that family and, in
12 fact, for the AP 1000, 17 more were added in for the
13 coverage check.

14 And then the last part of it is what we've
15 mentioned a few times already that there is some
16 flexibility as they're actually implementing
17 inspection for the region to make some changes to add
18 additional ITAAC if they feel that they come across a
19 family and there's one in that family that may be a
20 little different or is important enough to inspect.
21 So there is an element of some independent selection.

22 DR. APOSTOLAKIS: I think the two most
23 important, not most important but very important,
24 pieces of information you should have slides. One is
25 the weights. We had to ask you to give that to us and

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1 the scale of the utility, you said it's 1 to 5, 1, 2,
2 3, 4, 5?

3 MR. LAURA: That's the rating.

4 DR. APOSTOLAKIS: What does that mean?
5 What does 1 mean? What does 4 mean? Can you explain
6 those?

7 MR. LAURA: Yes. Five would be most
8 significant and 1 would be least.

9 DR. APOSTOLAKIS: And then -- So it's just
10 a --

11 MR. LAURA: It would probably take a more
12 --

13 DR. APOSTOLAKIS: -- graphic kind of
14 rating.

15 DR. KRESS: Question. This is a
16 prioritization and sampling process. You want to be
17 sure you don't miss too many things. Is there going
18 to be a test to see it actually works? For example,
19 are you going to take the AP 1000 and inspect all of
20 them and compare the results of all of them with your
21 sampling method to see if it really didn't miss very
22 much?

23 MR. LAURA: Yes. In an ideal world, that
24 might be possible. But the whole point of this is to
25 use our resources in the best way we can.

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1 DR. KRESS: But you know you have a lot of
2 these and if you just do it one time, that's maybe not
3 a lot of resource.

4 MR. LAURA: We're going to have -- If you
5 think about it, we're going to have multiple
6 applications and construction in parallel and we're
7 one agency and the decision generally has been made
8 that we cannot look at 100 percent of every ITAAC at
9 every plant being built.

10 DR. KRESS: Get 100 percent of one of
11 them.

12 DR. BANERJEE: But suppose this is very
13 optimistic and that we really don't get these multiple
14 applications. You could do what Tom says.

15 CHAIRMAN SHACK: But I think you have an
16 internal check if you're finding things and expanding.

17 DR. KRESS: Right.

18 DR. APOSTOLAKIS: Yes.

19 DR. KRESS: That's the --

20 DR. APOSTOLAKIS: What it takes is a
21 couple of times to shake their confidence and then I
22 don't think they're going to forget about this. If
23 they look and find certain things are not done the way
24 --

25 DR. CORRADINI: That's what the 2505 --

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1 DR. APOSTOLAKIS: I don't want to put
2 words in your mouth now.

3 DR. CORRADINI: That's the 2505 process
4 that is mentioned in the green book. The other thing
5 I guess is for historical, I asked you guys this
6 privately, but I guess I want to ask it so it's on the
7 record. Go back to all the 104 plants that are
8 operating. What was your construction inspection
9 percentage? It was about the same, maybe a little bit
10 lower.

11 MR. RASMUSSEN: Our viewpoint in terms of
12 inspection hours we believe were coming out similar to
13 what some of the later plants were and we're still in
14 the process of laying out procedures and validating
15 that.

16 PARTICIPANT: And don't forget this is a
17 baseline. This is to start and we have the ability
18 and we as an agency have proven that we will expand
19 our inspection universe for cause and we're ready to
20 do that if necessary. Also if you look at, for
21 example, the AP 1000, if you look at the ITAAC within
22 our baseline, the ones that are 0.4 or greater, you
23 will see one such as all the critical aisle
24 instructors, that the containment, the aux building
25 and the shield building are seismically, not only

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1 seismically, but can handle all design loads including
2 the critical aisle instructors which are the most
3 heavily loaded structures within the nuclear island.
4 So you have chunks of those huge ones, ASME. All of
5 those things we'll find a seismic qualification for
6 your passive core cooling system that are within the
7 baseline.

8 So you say what's outside the baseline.
9 You're going to find a lot of HVAC. You're going to
10 find a lot of testing. We're doing testing in 2504
11 in parallel. So the testing ones we don't do we'll
12 probably pick up under the 2504 process. So you'll
13 find that we're doing a lot.

14 DR. CORRADINI: Just for the sake of
15 background, the thing that's important to realize,
16 their pre-operational testing is 2504, not the 2503.
17 So you're going to have a whole set of pre-op testing
18 once construction releases the systems to the plant
19 staff to go through those.

20 MR. RASMUSSEN: That's absolutely right
21 and I wanted to put this slide back up. As you see
22 the 2504 program encompasses a lot of things that
23 really can't be independently extracted from the
24 ITAAC. The quality assurance applies to both ITAAC
25 and non ITAAC. However, we're going to focus on the

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1 program more than the individual products during those
2 inspections.

3 Problem identification and resolution is
4 going to be key for the licensees as they go through
5 these projects. The work planning controls, the
6 engineering aspects of translating the design elements
7 into the details, the design change process will be
8 ongoing throughout the process and those will have
9 impacts on ITAACs although our inspection focus is on
10 an ongoing and periodic through the 2504 program and
11 again, those both get rolled together into the 2505
12 for our ultimate allocation of resources.

13 DR. APOSTOLAKIS: Has the industry
14 complained about this being too burdensome?

15 MR. RASMUSSEN: They haven't quite figured
16 it out yet.

17 (Laughter.)

18 DR. APOSTOLAKIS: I really think you
19 should keep that point for a floating number. Don't
20 say that you have a cutoff.

21 DR. BANERJEE: Do they have access to the
22 B & V values that you assign to each of these?

23 MR. LAURA: No, not at this time.

24 MR. NEWBERRY: It is not intended to
25 publish any of the data going into it or those

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1 rankings afterwards. Those 0.4/0.3 numbers are not
2 going to be released.

3 (Several speaking at once.)

4 DR. CORRADINI: I can't imagine why not.

5 DR. MAYNARD: But in terms of --

6 PARTICIPANT: I really think we're being
7 overly --

8 DR. APOSTOLAKIS: -- this information.

9 DR. MAYNARD: This is not something that
10 -- I think we're worried too much about that. I don't
11 think that's an issue.

12 MR. RASMUSSEN: And we are going through
13 our program with industry in a series of public
14 meetings and keeping them informed as we develop this
15 and soliciting their input.

16 DR. MAYNARD: Actually from the industry
17 standpoint, they would be better off if you did 100
18 percent of these because the NRC does not have the
19 resources to do a good job on 100 percent. So you're
20 not going to get as thorough --

21 (Laughter.)

22 DR. MAYNARD: And then at the end of the
23 process, you would have a written document saying that
24 the NRC accepted all these things, whereas, right now
25 you're still on your own on those things that aren't

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1 inspected.

2 DR. CORRADINI: I was just going to say
3 their investment butt is on the line.

4 DR. ABDEL-KHALIK: Yes. Was there a
5 target percentage when you set that 0.4?

6 MR. LAURA: No. This is the result slide
7 and this is the real high level. If you look at the
8 AP 1000, out of the 672 population, 233 were selected
9 for direct inspection. That equates to 35 percent.
10 For the ABWR using the same 0.4 threshold, out of a
11 total of 881 population, 383 were selected and that
12 equates to 44 percent. So you see the actual
13 percentage is a little different, but when you start
14 to look at some of the reasons why it makes sense.
15 The designs are different. One is passive. One is
16 active. Also some of the ways the ITAAC were
17 constructed were a little different as well.

18 The third bullet just references that we
19 do have reviews in process to try to estimate how much
20 resource will it take to complete the baseline
21 program. That's an important effort ongoing.

22 And then the last bullet talks about the
23 assessment process that we've mentioned over and over
24 and that gives the ability to expand our samples if we
25 find problems. So that's an important element.

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1 DR. APOSTOLAKIS: Good.

2 MR. LAURA: And for the conclusion, these
3 are again the real high level statements. The
4 baseline inspection program consists of ITAAC
5 selected, the direct inspection, using a defined
6 prioritization process. The prioritization process
7 optimizes NRC resources. Completion of this program
8 will provide reasonable assurance that a significant
9 construction or design translation error does not go
10 undetected. So those are all of our --

11 DR. BANERJEE: So the experience with all
12 the previous inspections of these 104 plants is really
13 going in through the expert panels. Is that how it's
14 being factored in?

15 MR. LAURA: In one way, but also through
16 they become the starting point for the inspection
17 procedures. You know, as we write the new ones going
18 forward, a lot of the processes are still the same.
19 You know, welding to some extent is welding.

20 DR. BANERJEE: Right. But what was found
21 in the previous 104 plant inspections which were more
22 randomized I take it? There was some safety
23 significance and all this.

24 MR. LAURA: I believe --

25 DR. BANERJEE: How is that factor in.

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1 That's really what I'm asking.

2 MR. LAURA: I believe, and correct me if
3 I'm wrong, but I believe there were some reviews done
4 maybe by Research that looked backwards at
5 construction.

6 MR. RASMUSSEN: Correct. We wrote some
7 NUREG, I forget the number, that documents a lot of
8 those construction experience issues and we're
9 factoring those into our program. We're also looking
10 at ongoing international experience right now. How to
11 inspect (Microphone hit.) over a couple months,
12 observing the construction there. We're expecting
13 some feedback on that process. We're setting some
14 international dialogues to try to inform us with the
15 issues that are being seen in this new generation of
16 plants.

17 In terms of the old inspection, we have
18 the inspection procedures as a starting point.
19 Elements of those really aren't appropriate in our
20 process because they were evaluating the adequacy of
21 the design in parallel with inspecting the quality and
22 the construction. So we were able to -- Since the
23 design is agreed upon through the certified design
24 process, we're really more focused on simply the
25 implementation.

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1 PARTICIPANT: I think Tony and I bring to
2 this project a lot of experience under the
3 construction of the 104 plants you talk about. I was
4 assigned with Midland, Zimmerman, Marble Hill. So I
5 have some experience with problems and we looked at --

6 (Laughter.)

7 PARTICIPANT: We looked at the issues that
8 came up during those plants to see if our baseline
9 would give us coverage of areas like that and again,
10 one of the things that we learned, I think, over these
11 years from the original 104 was the NRC needs to be
12 reactive in a quicker manner than we were under the
13 Part 50. We need to be able to have assessment that's
14 more effective and quick responding to issues rather
15 than allowing them to fester. And I think this
16 process creates that. We didn't have a real separate
17 assessment process under Part 50.

18 DR. BANERJEE: How is this -- You know,
19 these plants for construction might be in the next
20 10/15 years. Who knows when they'll come. Right?
21 There's lot of opinion about that. But how is this
22 knowledge going to be passed on? That's the basic
23 issue that I'm asking about.

24 PARTICIPANT: Well, we still have the
25 bulletins, the circulars, all the information notices

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1 that was generated and I wrote a bulletin in 1982 and
2 we've all been involved in a number of generic issues.
3 Those issues are still available for us to feed to our
4 inspectors to --

5 DR. BANERJEE: Isn't there sort of a
6 primer that's being generated?

7 DR. CORRADINI: They're looking for
8 inspectors.

9 MR. RASMUSSEN: Let me address that. I
10 think one of the things that is underway is -- You've
11 probably been briefed on the Wizard system for the
12 license application review process. Well, we have our
13 SIPMs database and one of the elements that we're
14 evaluating is tying those lessons learned to the
15 specific ITAACs as we identify them and see them
16 applicable through that process. Also an effort that
17 the Region 2 is working on right now is to develop
18 inspection plans for these families of ITAAC and part
19 of that inspection planning process is rolling those
20 lessons learned in so that they can -- When they brief
21 that inspection plan, the inspectors will be aware of
22 those issues.

23 DR. BANERJEE: Is there some sort of cross
24 reference into this database associated with ITAACs so
25 you can go and look up previous experience, things

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1 like that?

2 MR. RASMUSSEN: Right. That's planned.
3 It doesn't exist yet.

4 DR. BANERJEE: Planned.

5 DR. CORRADINI: Other comments?

6 DR. APOSTOLAKIS: Is the Commission -- Go
7 ahead.

8 DR. ABDEL-KHALIK: You indicated that
9 there isn't really a difference in the resources
10 required to conduct the inspections using this
11 procedure versus the random process. So what do you
12 mean by the second bullet?

13 MR. LAURA: What we mean by that is we're
14 going to focus on the most important elements that
15 maybe we might have missed before. So it optimizes
16 our inspection.

17 DR. ABDEL-KHALIK: That way you're using
18 the same resources.

19 MR. LAURA: Right.

20 DR. ARMIJO: You're putting them in the
21 right place.

22 DR. CORRADINI: You had a question.

23 DR. ARMIJO: Yes, I had a question and
24 this is probably beyond the scope. Let's say, and I'm
25 going to just focus on this question of welding. What

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1 is the level of detail that your inspectors will look
2 at? Will you look at the, let's say, welding
3 procedures that the licensee is going to use before
4 they start welding as well as their inspection
5 procedures to see that all the lessons learned of the
6 past with all the grief we've had with all these
7 problems that those are incorporated into the
8 construction plan? You know, anybody can give you a
9 nice clean radiograph and say that's a nice weld. But
10 if you look at the rework, if you look at whether
11 there was post weld grinding, a bunch of stuff can be
12 done because people have forgotten what caused a lot
13 of the problems we've had in the industry. That's
14 where that level of detail -- You can't see it from
15 here, but I just wanted to get a feeling for it.

16 MR. RASMUSSEN: And inspection with the
17 welding family, if you will, has both the individual
18 welding processes and in the welding program, one of
19 the inspection that the region will do periodically
20 and there's a number of things that will drive this
21 inspection, change outs of crew, maybe some
22 periodicity, but they will go in and look at the
23 training qualifications of the actual welders, even
24 interview the welders that are doing the work to see
25 if they are, in fact, qualified to do those welds and

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1 look at those deeper issues.

2 I don't know. Mark, do you want to add
3 anything on that? Mark Lesser from Region 2.

4 MR. LESSER: Is this working? Yes, I'm
5 Mark Lesser, Branch Chief in Region 2 in the Division
6 of Construction Inspection. What we'll be doing is
7 using our inspection procedures which will incorporate
8 a lot of the lessons learned from past construction
9 projects, but it will -- An example like that would
10 look at the welding processes, welding qualifications,
11 welding materials, actually observe welding in
12 progress, review completed packages, observe and
13 review NDE results. So it will span the gambit of
14 welding, what's going on, and it will target certain
15 welds that are dictated by the prioritization process.
16 So we get snapshots by both the resident inspectors
17 and regional inspectors and these are the kind of
18 things that our inspectors are actually planning,
19 starting to look at and delve into the ITAAC to see
20 how that would actually be done.

21 DR. CORRADINI: Thank you. Other
22 questions?

23 DR. APOSTOLAKIS: Is the Commission aware
24 of all this? Have you --

25 MR. RASMUSSEN: The Commission was given

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1 a higher level briefing of this through that SECY
2 paper 07-0047 that prompted us to come here.

3 DR. CORRADINI: May 16th paper.

4 MR. RASMUSSEN: Yes, that's the latest
5 time. But in general, I think the level that the
6 Commission would understand it at is we're doing the
7 sampling process that informed by a prioritization.

8 DR. APOSTOLAKIS: There's an eminent
9 decision on their part?

10 MR. RASMUSSEN: No. In general, they
11 approved it and --

12 DR. CORRADINI: We're asked to comment on
13 it per the May 16th letter. But they've already
14 commented and issued what they wanted.

15 DR. APOSTOLAKIS: Okay. So our letter is
16 not that significant.

17 DR. CORRADINI: It depends on what you
18 say.

19 DR. APOSTOLAKIS: Depends on what we say.
20 Okay. I'm happy.

21 DR. CORRADINI: Mr. Chairman, I'll -- I'm
22 sorry. Dana.

23 DR. POWERS: One question. Why was the
24 AHP methodology selected?

25 MR. RASMUSSEN: Scott may be the best

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1 person to answer that.

2 MR. NEWBERRY: I'll do my best. Scott
3 Newberry. Just a background comment first. I had a
4 team made up of decision making expertise,
5 statisticians, risk assessment, etc., Dana, and the
6 recommendation from my decision maker person was that
7 it was readily available and applicable. He was
8 familiar with other applications and also problems
9 with AHP that I'm not familiar with, but I think it
10 seemed to fit the bill and was easily applied for this
11 process.

12 And again, there is some misunderstanding.
13 Really, the AHP was solely used for the relative
14 weighting and there's always confusion about that. It
15 was solely used for the relative weights on the
16 attributes. It had nothing to do with the decision.

17 DR. APOSTOLAKIS: Yes. There was a
18 misrepresentation, I think, earlier when somebody said
19 that this is based on the AHP. That's not true. It's
20 decision analysis. The AHP helps you find pieces of
21 it like the weights. So there are problems that exist
22 in the literature that really don't apply because the
23 ultimate decision is not based on the AHP.

24 DR. POWERS: I guess I don't quite
25 understand that. If I took the AHP results out of

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1 this process, I don't think I end up with the same
2 decision, do I?

3 DR. APOSTOLAKIS: No, you would because
4 then you would ask your subjects to give weights
5 directly instead of deriving the 0.33 from AHP. So
6 essentially, what happens is you go through the AHP
7 and then they look at them and they say, "Does this
8 make sense?" And the subjects are free to change.

9 DR. POWERS: I understand that.

10 DR. APOSTOLAKIS: What?

11 DR. POWERS: I understand that, but you
12 would come up with a different result if you did not
13 have --

14 DR. APOSTOLAKIS: I don't think so because
15 they agreed on the 0.33. The 0.33 is really what is
16 derived from the AHP and if the staff disagreed, they
17 wouldn't assign it. So the AHP is just a method of
18 facilitating the process. But its results are subject
19 to a deliberation by the experts in fact. So it's
20 really a small part of the process.

21 DR. POWERS: Let me ask a different
22 question then. Suppose that I had substituted in a
23 different methodology such as multi-attribute or
24 something like that.

25 DR. APOSTOLAKIS: Well, that's what it is.

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1 DR. POWERS: Well, it is but it's a little
2 better than a multi-attribute. Would I have gotten a
3 different answer?

4 DR. APOSTOLAKIS: No. What they are doing
5 is multi-attribute utility theory. That's what
6 they're doing. It's just that the AHP is just a
7 supporting method to get the weights which then are
8 subjected to the evaluation of the staff. So the AHP
9 is really -- It's a misrepresentation to say that this
10 is an AHP-based method. It's not. You could use any
11 method you want to get the weights or even a direct
12 estimate and say "We think safety is 0.4." Then the
13 issue doesn't even arise. But the essence of it is
14 multi-attribute utility theory.

15 MR. RASMUSSEN: I would also add that our
16 cutoff point of 0.4 for the targeted versus
17 nontargeted and then our sensitivity studies of that
18 selection provides some validity to the fact that if
19 a different methodology was used, it probably wouldn't
20 wildly swing where we ultimately drew that line --

21 DR. APOSTOLAKIS: I think the problem with
22 AHP is that it was oversold by the original developer
23 as a decision making methodology, ignoring these
24 issues of utility and all that and that's when the
25 decision analysts came back with criticisms. But you

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1 have rank reversal and all that. But this is when you
2 use it as a decision making theory which is not being
3 used here.

4 MR. RASMUSSEN: Right.

5 MR. LAURA: It's very subtle in the green
6 book. It's an easy --

7 DR. APOSTOLAKIS: Don't say that it's
8 based on AHP. That's a misrepresentation.

9 MR. LAURA: Right. And if you look at our
10 slides, we have it correct that the AHP was used just
11 for the weights.

12 DR. CORRADINI: Mr. Chairman. Thank you
13 very much.

14 CHAIRMAN SHACK: Thank you very much. Any
15 further comments or questions?

16 (No response.)

17 CHAIRMAN SHACK: Time for a break. Be
18 back at 10:35 a.m. Off the record.

19 (Whereupon, at 10:18 a.m., the above-
20 entitled matter recessed and reconvened at 10:35 a.m.
21 the same day.)

1 CHAIRMAN SHACK: On the record. We can
2 come back into session. Our next topic is on
3 dissimilar metal welds. As you'll recall, dissimilar
4 metal welds, we have nickel alloy welds that are used

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1 to join typically ferritic components with stainless
2 steel components and they're subject to cracking.
3 Industry has had an inspection and mitigation program
4 for these kinds of welds in place, but it was sort of
5 given kind of a boost here by an incident at Wolf
6 Creek where we have circumferential flaws which ups
7 the ante a bit.

8 And so we have a combined NRC industry
9 program to address this and we're here to hear
10 progress on that today. And I guess, Ted, you and Al
11 are leading off.

12 MR. SULLIVAN: Right. So I'm going to
13 lead off with a very quick summary of the information
14 that we went over earlier this year. We had meetings
15 with ACRS in February and March and the opening
16 occasion for this project really was the Wolf Creek
17 inspection findings which are listed on this first
18 slide.

19 We found -- Actually, the utility found
20 five circumferential flaws in the pressurizer nozzle
21 dissimilar metal welds. There was a large one in a
22 relief nozzle. There were three indications found in
23 the surge line nozzle and one in the safety nozzle.

24 And our concern was that this was the
25 first case where we'd seen more than one indication or

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1 flaw in the same weld and they were all
2 circumferential and we'd saw quite a large indication
3 compared to what we'd seen in the past.

4 We thought we'd put this up. This is
5 maybe a visual summary of the opening remarks that Dr.
6 Shack was making. I think, if you look at the figure
7 on the right, I'd like to talk to that first briefly
8 and indicate that, of course, the darker component
9 there is the low alloy steel nozzle.

10 It's eventually going to be mated up with
11 a stainless steel piping product. The welding
12 approaches used in the United States have a butter
13 which is shown in, an Alloy 182 butter which is shown
14 in, the color yellow and that's to facilitate the heat
15 treatment of the low alloy steel which has to be done
16 subsequent to welding to restore the fracture
17 toughness of the properties.

18 So after the butter and heat treatment, a
19 stainless steel safe end is welded on. That is the
20 dissimilar metal or Alloy 82/182 weld that's used to
21 attach the safe end as shown in red and then the
22 component is ready to be shipped to the field for the
23 field welding of the stainless steel product.

24 In the figure on the left, I just wanted
25 to point out that there's a fill-in weld that is

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1 applied over the butter and the weld to the safe end
2 and there's also a thermal sleeve shown in this
3 particular diagram which is common for the surge
4 nozzle welds.

5 When we took a look at the inspection
6 findings from Wolf Creek, we concluded that we needed
7 to do a fracture mechanic study to try to understand
8 what could possibly happen as a result of these flaws.
9 The reason I'm kind of into mixing between flaw and
10 indication is that the inspection findings turn up
11 indications, but when you do the fracture mechanics
12 evaluations to evaluate integrity, you re-label them
13 as flaws. So I don't mean to be confusing about the
14 terminology I'm using.

15 These flaws, as I indicated in the earlier
16 presentations this year, were concluded by the license
17 DV most probably attributable to or due to PWSCC. As
18 part of this study, what we were doing was fracture
19 mechanics evaluation using ASME Section 11 approaches
20 and the point of it was to calculate the time for the
21 indications or flaws as they were measured to grow to
22 a size where they would produce leakage and then from
23 there to calculate the time from leakage to rupture
24 and also to calculate leak rates. And in regulatory
25 terms, what we were trying to do was determine whether

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1 or not the inspection schedule that the industry was
2 pursuing was adequate and whether or not the leak
3 detection methodology needed to be enhanced in some
4 way. And we showed these results previously, so I
5 won't dwell on them other than to say that for the
6 relief line we saw that most of the cases were leading
7 to rupture and leakage at the same time and even for
8 the safety nozzle, some of the cases were showing the
9 same result.

10 As a result of all this, as shown here, we
11 concluded that the inspections needed to be
12 accelerated for some plants. What we concluded was
13 that we thought that the inspections should all be
14 done this year, not continuing on into 2008. And we
15 also concluded that we wanted enhanced leakage
16 monitoring frequency and action levels established.

17 The basic programs that industry uses for
18 leakage monitoring we thought were fine, but we wanted
19 to find frequency and action levels that may have been
20 different from what the utilities would have followed.
21 So we obtained agreements from the licensees to
22 address those two concerns of the staff. We issued
23 confirmatory action letters indicating, you know, what
24 I just discussed and industry proposed that they
25 wanted to undertake some advanced finite element work

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1 to try to address our concern and if it could be
2 addressed, if NRC could reach reasonable assurance
3 that the concern was such that the inspection
4 schedules could continue on the original path, then
5 that would be a possible outcome.

6 So industry has undertaken a program that
7 they're going to start describing in a couple minutes
8 of doing an advanced finite element fracture mechanics
9 analysis. I think one of the main features of it is
10 that the artificial conservatism of a semi-elliptical
11 flow was removed from the analysis methodology and
12 this allows a more realistic progression of the crack
13 growth. And I guess as we've talked about several
14 times, the objective is to determine whether or not
15 it's viable to expect leakage prior to rupture for the
16 nine plants that are effected by or most effected by
17 the CAL.

18 So I think with that, I'll be glad to
19 answer any introductory questions and otherwise we'll
20 go to the industry.

21 CHAIRMAN SHACK: Just a question of
22 schedule. When does the decision have to be made
23 whether they will have to accelerate the mitigation or
24 not?

25 MR. SULLIVAN: I can answer it now or I

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1 can answer it at the very end of the presentation.

2 CHAIRMAN SHACK: Why don't we go to the
3 very end?

4 MR. SULLIVAN: Okay.

5 MR. ARMIJO: I had a quick question on the
6 Chart Number 3, the picture. Now, these are ideal
7 weld geometries. But in reading the material that you
8 sent out, there's been a lot of repair work that was
9 done on some of these welds and you may answer it now
10 or later, if it's in the presentation, but was that --
11 was a weld cracking, did it correlate with those
12 repairs or not?

13 MR. CSONTOS: There wasn't a one-to-one
14 match with the repair. There's not enough information
15 in the fabrication records to link up one-to-one to
16 where they're located, the cracks are located to where
17 the repairs were. The industry has a slide or -- not
18 a slide but they have a schematic in one of their
19 first reports that show where the repairs were. What
20 we know is they were roughly in the butter, the
21 cracks, and also the butter was repaired several times
22 on the relief line. I can't remember how many times
23 it was.

24 MR. ARMIJO: I know, it's very complicated
25 so --

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1 MR. CSONTOS: Nine, eight or nine times.

2 MR. ARMIJO: So a lot of complicated
3 fabrication which leads to complexities in the
4 analysis and --

5 MR. CSONTOS: We'll get into that in the
6 second part of the slides and I'm sure the industry
7 will get into that as well. But we did evaluate cases
8 for no repairs and repairs. We've also looked at
9 fabrication records for the nine plants and we'll get
10 into that and to see about repairs and fabrication.

11 MR. SULLIVAN: I do want to just add,
12 though, it turns out that the more conservative cases
13 are no repairs.

14 MR. CSONTOS: Yeah, and we'll get into
15 that.

16 MR. SULLIVAN: And that will be explained.

17 MR. ARMIJO: So repairing is good.

18 MR. CSONTOS: For this case.

19 MR. SULLIVAN: Well, if you're going to
20 get -- if you're going to get crack initiation, the
21 repairs are good because they're much more likely to
22 lead to leakage.

23 MR. ARMIJO: You mean, it will accelerate
24 the --

25 MR. SULLIVAN: They tend to drive the

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1 crack through one side of the pipe. Maybe that's one
2 way to say it.

3 MR. CSONTOS: The weld -- stresses develop
4 from the repairs will drive a crack to grow through
5 wall locally and not globally 360 around. And so in
6 that respect, it's beneficial in this case where we
7 will drive a crack to a leakage with a repair versus
8 growing 360 which we'll show you in the typical
9 fabrication.

10 MR. SULLIVAN: So that outcome kind of
11 alleviated our concerns that we may not be able to
12 fully grasp all the repairs that were done or may have
13 been done. It works out to be beneficial.

14 MR. CSONTOS: Of course, the repair, it
15 depends upon how deep the repairs are etc., but that's
16 a nuance that --

17 DR. MAYNARD: It's beneficial once a crack
18 is there. It's not beneficial --

19 MR. SULLIVAN: Right.

20 MR. ARMIJO: It nucleates cracks. But
21 having done that, it has a --

22 DR. MAYNARD: Once given if it's a crack,
23 that's an event.

24 MR. CSONTOS: But again, it depends on the
25 type of repair. I just want to make that caveat.

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1 MR. ARMIJO: Okay.

2 MR. SULLIVAN: So with that, we'll turn it
3 over to Industry.

4 MR. SHAHKARAMI: Good morning, Mr.
5 Chairman and Committee Members. We appreciate the
6 opportunity to be here to show you the progress of our
7 analysis that we have undertaken. I'm Amir
8 Shahkarami. I'm a Senior VP for Exelon Nuclear. I
9 have engineering, project management, fuel and other
10 responsibility for the fleet. And I have with me
11 Glenn White who was instrumental and our contractor
12 that helped us with the analysis and updating the
13 finite element software that helped us get where we
14 are today.

15 The reason I'm here is not that much from
16 the Exelon perspective but we have an organization,
17 industry organization, called PNMP. An underlying
18 committee under that is a Steam Generator and Material
19 Reliability Program that addresses all the material
20 issues with the PWR topics. It's similar to what we
21 used to BWR VIP. This is the mirror image of that and
22 I serve on the Executive Committee of the PNMP as well
23 as MRP and I was selected as the Executive Sponsor for
24 this analysis. And that's the reason I'm here to give
25 you the update. And I'm going to ask Glenn on a few

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1 slides to jump in and help me out with that. We
2 believe going through all this analysis the-leak-
3 before-break approach that we have used for centuries
4 remains intact and what we're going to show you is
5 going to support that.

6 Let me talk about the objective of the
7 plan we put forward. We basically wanted to prove
8 that we do get through-wall leakage prior to the
9 rupture of the pressurizer nozzles. We did a similar
10 valve that Ted talked about. We have nine PWR that
11 their outage right now is scheduled for the spring of
12 2008 and we've done the PDI mitigation which we were
13 planning to do that during those outages and, just
14 remember that in the fall of 2007, there are numerous
15 plants that have to go through such inspection or
16 mitigation process as well. So we are challenged with
17 the aspect of resources and how are we going to
18 implement that. I'll talk about that later.

19 Let me get to this slide because I think
20 Ted touched on these things. The semi-elliptical
21 crack shape progression that has been used in the past
22 is extremely conservative when we take that and use an
23 arbitrary crack shape progression. And what it does
24 is rather than uniform ligament tearing up, we see on
25 the right-hand side that you actually collapse that,

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1 you either arrest it or you get to the point that
2 gives you much more realistic picture and allows you
3 to have more ligament still intact. So that's the big
4 difference between the two and this was the biggest
5 input into our analysis that we have performed.

6 As I said, as the Executive Sponsor, we
7 formed a team. We had Dominion Engineering which
8 Glenn is part of it. We had Quest Reliability that
9 had the software, original software developer. We put
10 the panel together and, as you can tell, some of these
11 people, maybe family are with you, very, very
12 experienced individuals and when it got to who's going
13 to be there with a fresh eye, we asked Dr. David
14 Harris who has been away from Alloy 600 topic for
15 awhile, to come back and give us that oversight and
16 make sure that every step of the process has been
17 looked at and challenged.

18 We also had up-to-date seven NRC public
19 meetings. So as we start having a scope of our work,
20 the detail of the charter, how are we going to go
21 about doing these things, we interacted with NRC staff
22 and I think that has helped really to address some of
23 the issues that we had in the past. But again, I
24 think the technical counterpart on both sides being
25 able to discuss and address the issue was definitely

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1 instrumental in where we are today.

2 So some of the activity that involved our
3 project; first, we had to get the software do the
4 things it wasn't doing before. And that took
5 tremendous amount of energy to update that. And then,
6 we start looking at the crack size calculation to
7 define the end point for the crack growth and that was
8 the picture that I showed you, that, you know, you get
9 to the real progression of the cracking by doing it
10 that way.

11 And then the individual plant had a
12 different loading. They had different configurations.
13 We had to take those into account. So it was very
14 hard to do just one piece and we bound all nine units
15 at all six locations. So we went to a very specific
16 way of doing it. The leak rate calculation, we used
17 the EPRI software as well as the NRC model that was
18 developed and did a lot of sensitivity metrics of the
19 welding and I'm going to get into the detail of that
20 including the residual stresses that could have been
21 imposed during the installation and the repair.

22 We also implemented a parametric
23 sensitivity case matrix that we get into detail on
24 that as well and then the validation of the software,
25 you know, updating it and how we're going to validate

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1 that, and then continuous input from expert panel that
2 I talked to you earlier.

3 On evaluation case metrics, the central
4 element of the project is the extensive metrics of
5 base and sensibility cases that were evaluated in
6 order to sketch an initial picture and then fill in
7 the significant details such that meaningful
8 conclusions could be drawn. These micrometers
9 (phonetic) were identified to explore the effects on
10 crack growth, leakage and critical size determination.
11 These are addressed in a bit more detail in the next
12 slides.

13 Let me just touch on plant specific
14 because we had to go back site-by-site and understand
15 where everybody was at the time we started this. If
16 you look at it, typically this pressurizer have six
17 nozzles. But if you say nine times six gives you the
18 number that is more than what we have here and I'll
19 give you the reason. On the safety and relief
20 nozzles, you had 35 of those and one plant has already
21 -- the design feature only had three of those. So
22 that accounts for one of the ones that I was talking
23 earlier. So we were able to get this 35 and
24 represented by five geometrical configuration.

25 The spray nozzle, there were eight and the

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1 reason is one was PDI in 2005 and we were able to
2 group those in a four geometrical configuration. And
3 the surge nozzle, eight again, and one was already
4 overlaid, well overlaid, and that was represented by
5 two configurations. So we planned a specific nozzle
6 geometry were investigated for each nozzles in the
7 subject population as well as Wolf Creek by review of
8 design drawings. Based on this review, the nozzle
9 were grouped to combine nozzles with sufficient
10 similarity and from a geometric perspective and
11 optimize the number of geometrical configuration that
12 is reflected in our metrics.

13 Now, I want to talk about plant specific
14 piping loads. I addressed that earlier that they are
15 different and, what we did, we maintained the pressure
16 at 2,235 pounds for the analysis. But there was a
17 range of actual members of stress loading as well as
18 range of bending the stress loading that had to be
19 taken into account.

20 Crack growth load included dead weight,
21 normal thermal pipe expansion loads in addition to the
22 internal and crack phase pressure. Critical crack
23 sizing calculation also included normal operating
24 thermal loads in addition to internal and crack face
25 pressure and dead weight loads. Basic element in the

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1 treatment of finding specific piping loads used to
2 calculate crack growth and critical crack sizes.
3 Cases were analyzed for the range of actual members
4 and bending and stresses for all nine plants.

5 Now let me touch on residual stresses.
6 Source of input information for welding residual
7 stresses consideration, a noteworthy factor is they
8 are identified as being particularly relevant to the
9 final residual stresses profile. In addition to
10 studying the variation in welding residual stresses
11 distribution, the method of defining a welding
12 residual stresses in the crack growth finite element
13 analysis was also studied.

14 As you can see here, fabrication, a step
15 that would effect such residual stresses, and I think
16 it goes back to what you had asked earlier in respect
17 to repair, is when you have the fillet weld on the
18 thermal sleeve. That happens at the surge line and
19 then fillet weld for the safety and relief valve and
20 a stainless steel fillet welt to the pipe. Those are
21 the configuration that could induce, as well as when
22 you do the repair, the ideal repair has an impact on
23 that.

24 MR. ARMIJO: Now, some of those repairs
25 were just welded, you know, chipped out for the defect

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1 and rewelded and some had post-weld heat treatment of
2 that local repair, I think.

3 MR. SHAHKARAMI: Right.

4 MR. ARMIJO: Now, did you treat all of
5 those in your analysis to see if that combination of
6 non-standard fabrication would lead to something
7 different?

8 MR. WHITE: Yes, we came up with a series
9 of cases to look at weld repairs. We did some
10 different types of repairs in the welding residual
11 stress simulations and then carried those results
12 forward into the crack growth calculation.

13 MR. ARMIJO: Okay, so you deliberately
14 looked for the worst case fabrication to see if that
15 somehow could leads --

16 MR. WHITE: Right. Repair for example,
17 yes.

18 CHAIRMAN SHACK: Of course, the worst case
19 is kind of a tricky thing here.

20 MR. ARMIJO: Well, worst case from initial
21 fabrication could it possibly be --

22 MR. SHAHKARAMI: For the case that was
23 considered.

24 MR. ARMIJO: Yes. Right.

25 MR. SHAHKARAMI: So even thermal strain

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1 applied to simulate the residual stress profile or we
2 used the finite element result directly to input in a
3 crack growth model.

4 DR. ARMIJO: Just let me come back to that
5 for a second, too. On the pipe bending again, I
6 always think the code is giving me conservative
7 calculations of the pipe bending which is conservative
8 for some things, but, in fact, it's non-conservative
9 for this case because it gives me more non-axisymmetry
10 that helps me out.

11 MR. SHAHKARAMI: Right.

12 DR. ARMIJO: I assume that you sort of
13 covered that with your range of pipe bending loads.

14 MR. WHITE: We looked at the full range.
15 For each configuration, we went from zero bending all
16 the way up to the maximum bending reported for any of
17 those welds in that category of the full range.

18 MR. SHAHKARAMI: Next, the crack growth
19 rate equation. Although the crack growth rate of this
20 material as presented in MRP-115 is generally accepted
21 as the best available information is not without some
22 uncertainty and as part of our uncertainty evaluation,
23 we did consider that. I'm not going to go through the
24 detail, but you know what percentile we used and how
25 we combine it was considered and there was no credit

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1 taken for the primary water and stress corrosion
2 cracking growth of *** 11:00:16 threshold.

3 The initial flaw geometry. Early in our
4 analysis process, the effect of initial flaw shape was
5 investigated to determine what effect this would have
6 on crack growth using the new arbitrary crack shapes
7 analytical capability. These studies determined that
8 the true wall flaw shape is insensitive to the initial
9 flaw shape for a given aspect ratio on depth. This
10 behavior has been confirmed in the final metrics of
11 the cases.

12 The sensitivity for the initial flaw
13 geometry considered initial depth, initial aspect
14 ratio that is a function of ID and the depth for the
15 uniform depth surface flaw and initial shape factor.
16 Sensitivity case indicate the crack upon true wall
17 penetration is insensitive to initial as I've
18 described earlier. I just wanted to reinforce that.
19 Next.

20 This is another issue that Mr. Sullivan
21 talked about, the effect of multi-crack initiation
22 that we had at Wolf Creek. This points out that
23 multiple cracks such as those reported for Wolf Creek
24 surge nozzle were considered in this project. Because
25 the presumption of multi-flaw imposes a number of new

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1 variable, if one is to explicitly add this to range of
2 possible relative orientation, circumferential
3 spacing, interaction, etc., bonding approaches were
4 applied which incorporated potentially significant
5 conservatism, for example, assuming that initial flaw
6 that is 360 degrees in length.

7 Enveloping of multiple initial flaw with
8 one model flaw modeling a part depth to 360 flaw and
9 doing multiple individual flaw and then combining on
10 a single weld cross-section for a stability
11 calculation that I'll get into later.

12 Page 13. Evaluation case metric
13 description. The next two slides summarize the case
14 micrometer category for the final metrics. There were
15 117 total finite element analysis performed with five
16 cases still being finished in the next week or so.
17 The basic set of 53 cases were evaluated with from one
18 to three different welding residual stresses. So you
19 get 53 plus some variation among those that called for
20 108 of 117 total analysis. Nine supplemental finite
21 element analysis were performed to address the
22 specific surge line issues.

23 So if I go through here on a geometry and
24 load base cases, that's case 1 through 20 when we went
25 through to look at axisymmetrical residual stresses

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1 with moment load varied to maximum as you asked
2 before, the ideal repair base cases, that's Case 21 to
3 26 and again, we looked at non-axisymmetrical residual
4 stresses on ID and repaired with respect to what we
5 did finite element model. We also looked at further
6 bending moment sensitivity. That was Case 27 through
7 30.

8 We also looked at sensitivity cases in
9 investigate potential uncertainty in an as-built
10 dimension and that was Case 31 to 32. And we get plus
11 or minus 10 percent variation in the weld thickness.
12 Axial membranous load sensitivity cases, that was Case
13 33 to 34, when we focus on relative narrow ranging
14 membranous load for each geometry. The effect of
15 length over which the thermal strength simulating
16 residual stresses were applied, that was Case 35.
17 Simulation of elastic-plastic, the distribution of a
18 stress in ID, that was Case 36. The effect of initial
19 crack shape and depth, Cases 37 through 41. The
20 effect of a stressing intensity factor dependence on
21 crack growth rate equation, that was 42 to 47 and
22 effect of pressure drop along the leak crack was Case
23 48. We also took into account a fact of relaxation of
24 normal operating thermal loads for Cases 49 and 51
25 through 59.

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1 DR. BANERJEE: Can I just ask you a
2 question?

3 MR. SHAHKARAMI: Yes.

4 VICE CHAIR BONACA: Each of these cases,
5 how many nodes did you used?

6 MR. WHITE: We used on the order of 80 to
7 150 nodes along the crack front. And then for total
8 nodes in the model, I believe 20,000.

9 DR. BANERJEE: Is this sufficient
10 resolution?

11 MR. WHITE: Yes, we've done node
12 convergence studies.

13 DR. BANERJEE: Do you talk about those?

14 MR. WHITE: Space convergence studies and
15 time convergence studies to --

16 DR. BANERJEE: That convergence studies?

17 MR. WHITE: That's right, so we get the
18 same result when we increase the normal density to
19 show that we do have convergence on the finite
20 approximation.

21 DR. BANERJEE: So each of these runs with
22 20,000, that's not a very high degree of nodalization.

23 MR. WHITE: I'm going on memory of --

24 DR. BANERJEE: It's relatively coarse.

25 MR. WHITE: We have some pictures of

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1 meshes.

2 MR. SHAHKARAMI: We're going to show you.

3 MR. WHITE: There's a good -- let me get
4 back to it.

5 DR. BANERJEE: All right.

6 MR. SHAHKARAMI: I think what you
7 mentioned is the element along the crack length.

8 MR. WHITE: Yes.

9 MR. SHAHKARAMI: But overall, you're going
10 to see there is much more meshing involved.

11 The effect of nozzle to safe and crack
12 growth model, there's a standard cylindrical that was
13 52 to 53. That's where we investigated the effect of
14 the detailed geometry and then in addition to those 53
15 cases, we had eight supplemental cases specific to the
16 effect of multi-flaw and a limiting surge line and
17 that was specific to that nozzle.

18 What I'd like to do is maybe turn it over
19 to Glenn to cover the next two pages as far as the
20 calculation for critical crack size and then the leak
21 rate.

22 MR. WHITE: Yes, thanks. Critical crack
23 size defines the end point of the calculation, of
24 course, and this was a major activity with the expert
25 panel to define appropriate methodology here.

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1 The first step is that we assume the flow
2 strength of properties based on the safe end material.
3 There's work showing if the flaw is located close to
4 the safe end then those strength properties govern the
5 net section collapse. So even though we have results
6 showing the limiting stresses are more towards the
7 butter region, we're assuming safe end strength
8 properties. There is a procedure worked out by Rahman
9 and Wilkowski that's been published on an arbitrary
10 flaw shape solution. So we can, in spreadsheet form,
11 go around and input the crack profile and arbitrary
12 profile all the way around the circumference and
13 calculate the mid-section collapse.

14 DR. ARMIJO: Could you just go back to
15 that first bullet?

16 MR. WHITE: Sure, yes.

17 DR. ARMIJO: The cracks are either in the
18 butter or in the weld to the safe end. Which one is
19 -- where are the cracks?

20 MR. WHITE: Well, they can be --
21 hypothetically, they can be at any location, more in
22 the butter, in the middle of the dissimilar metal weld
23 or perhaps, at the end of the dissimilar metal weld
24 that's right adjacent to --

25 DR. ARMIJO: At the fusion line, or

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1 something like that.

2 MR. WHITE: At the fusion line.

3 DR. ARMIJO: For the Wolf Creek, did you
4 have enough resolution to say where the indications
5 were?

6 MR. WHITE: Yes, they were indicated to be
7 more in the butter region where there would be better
8 strength.

9 DR. ARMIJO: I don't understand why you
10 use material properties for the safe end and not the
11 material properties for the actual component that's
12 cracking. Can you explain that?

13 MR. WHITE: Because the safe end has
14 stainless material that's a little bit lower strength
15 than the Alloy 182 nickel weld material and lower
16 strength still than the low alloy steel nozzle, and it
17 just so happens when you have these multiple
18 materials, how the plasticity behaves can be limited
19 by the strength properties and the lower strength
20 adjacent material. So the plastic zone is not just
21 confined in the nickel alloy material.

22 DR. BANERJEE: Does this mean that you
23 sort of homogenize the properties in the other domain
24 or you use different properties in different regions?

25 MR. WHITE: Well, this is a spreadsheet

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1 type calculation that is done. There are net section
2 collapse equations that are just assumed that you
3 reach closed stress level stresses, tensile on one
4 side of the plastic hinge and compressive on the
5 other. And so that is just for homogeneous material.

6 And then the question is, if you have a
7 weld with multiple materials, what is the appropriate
8 effect of strength material to use? And there is test
9 data with full size samples that supports using the
10 roller strength adjacent based on material in the
11 strength.

12 MEMBER BANERJEE: That is sort of
13 empirically based?

14 MR. WHITE: Yes, with some finite element
15 work, not done in this project but done by others,
16 showing -- explaining why that behavior is --

17 MEMBER BANERJEE: Is this work going to be
18 peer-reviewed by an independent group or not?

19 MR. WHITE: Yes. Well, within the
20 industry --

21 MEMBER BANERJEE: Outside the industry,
22 are there going to be some academics at all looking at
23 this stuff or is it just industry people
24 peer-reviewing this?

25 MR. WHITE: Well, as we mentioned, we

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1 brought in one industry person that hasn't been
2 involved in an alternate plan. We have brought in Dr.
3 Ted Anderson, who is a fracture mechanics expert that
4 works mostly in other industries. And we're using him
5 as an independent reviewer as we move along.

6 MEMBER BANERJEE: A lot of these arguments
7 are very intertwined and technical, I mean, partly
8 empirical, partly finite element. It's sort of a
9 mish-mash of stuff that you're telling us?

10 MR. WHITE: Yes. We're building on a
11 tremendous amount of work that has been done, piping
12 integrity program work over the last 25 years that's
13 largely been sponsored by NRC and done at Battelle.
14 So there's been a tremendous amount of work that's
15 been done to develop methodologies for looking at
16 failure of --

17 MEMBER BANERJEE: It would be nice if
18 somebody could take a cold-blooded look at this who
19 has never been involved in this from a university or
20 something where they do this sort of stuff for a
21 living, you know.

22 CHAIRMAN SHACK: Haven't taken a look at
23 it, then?

24 MEMBER BANERJEE: Well --

25 MR. CSONTOS: Can I mention something

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1 here? But on the NRC side, we have Engineering
2 Mechanics Corporation of Columbus as our contractor.
3 This is Al Csontos, staff.

4 We have another contractor, Battelle
5 Memorial Labs, that will be doing an independent
6 review. They have not been involved in this analysis
7 at all, but they have been well-aware of all of the
8 work that has been going on in this area for the past
9 10-15 years, 20 years. And they will pull it all
10 together and see whether or not -- they will be an
11 independent review for NRC's evaluation, too.

12 MEMBER BANERJEE: Anybody who has not been
13 an NRC contractor involved?

14 MR. CSONTOS: We will be presenting this
15 at international conferences that are specific to this
16 type of evaluation protocols, I mean. That is the
17 only outside academic --

18 MEMBER BANERJEE: So there won't be a
19 journal article, which would be --

20 MS. CSONTOS: Yes, there will --

21 MEMBER BANERJEE: -- peer-reviewed by --

22 MR. CSONTOS: Yes, there will be. In
23 fact, there is already one going out right now.

24 MEMBER BANERJEE: Well, we will return to
25 this. Let's carry on.

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1 MR. WHITE: I'll just quickly step through
2 in here, finish up this slide. Then there come some
3 fundamental choices to make in this sort of
4 methodology. One is that we included the full thermal
5 stresses, the thermal piping stresses, in the critical
6 crack size calculation.

7 So these are secondary type stresses. And
8 there are test data and additional evaluations that
9 were done as part of this project that tend to
10 indicate that these loads would relax as the cracks
11 grow, get a rotation that the crack tends to relieve
12 the display control logs, but we are not taking credit
13 for that in the calculations. We are putting no
14 normal operating thermal loads.

15 And also, even though there is data that
16 doesn't show evidence that an EPFM failure mechanism
17 is controlling, we are including a Z-factor or
18 approach based on data that has been published, to
19 include the EPFM failure mechanism. So there are some
20 conservatisms there.

21 And then we take these models, and we
22 apply them on the crack growth profiles that we get
23 from the crack growth calculation and then track the
24 stability over time, how the stability's margin factor
25 is reduced as the cracks grow.

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1 And then, of course, the leak rate
2 calculation is another post processing that we have to
3 do to the crack growth. We're using both PICEP and
4 SQUIRT. PICEP tends to give a little bit of a smaller
5 leak break. So that's conservative from this leak
6 before break point of view.

7 We're using PWSCC morphology parameters.
8 And we're taking the crack-opening areas of
9 displacements directly from the finite element
10 analysis and applying those into PICEP and SQUIRT,
11 rather than using the COD inside those programs.

12 MEMBER BANERJEE: So does this PWSCC more
13 forwardly give you some sort of a roughness or what
14 does it do?

15 MR. WHITE: That's right. It is a surplus
16 roughness and a tortuosity in terms of number of terms
17 per inch.

18 MEMBER BANERJEE: So if it wasn't PWSCC,
19 what would you do?

20 MR. WHITE: If it was transgranular
21 fatigue cracking, it would be a much less torturous
22 path. And you would get a higher leak rate for the
23 same size crack.

24 MEMBER BANERJEE: Is this sort of bounding
25 in terms of --

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1 MR. WHITE: Well, these are best estimate
2 types of codes. We have evaluated. There have been,
3 of course, leak rate experiments done. And we have
4 statistically evaluated that. And there was about a
5 factor of one and a half uncertainty.

6 And then we're actually applying a factor
7 of four margin factor, as we will see in an additional
8 slide, to make sure we take care of other potential
9 sources of uncertainty.

10 MEMBER BANERJEE: So these codes take
11 flashing into account and --

12 MR. WHITE: Correct.

13 MEMBER BANERJEE: -- the tendencies and
14 all of this stuff?

15 MR. WHITE: It's a two-phase choke flow,
16 non-equilibrium thermal hydraulic code that's been
17 calibrated against test data. That's how they work.

18 MEMBER BANERJEE: Is this partially data
19 that Schropp took or whose data is it?

20 MR. WHITE: Well, a lot of the testing was
21 done at Battelle.

22 MEMBER BANERJEE: No. I mean the data.
23 Where did the data come from?

24 MR. WHITE: I believe that the experiments
25 were done at Battelle largely.

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1 MEMBER BANERJEE: Through PWSCC cracks?

2 MR. WHITE: Well, through IGSCC cracks,
3 but the parameters are slightly different between
4 IGSCC and PWSCC. So we have adjusted them to the
5 PWSCC. They were --

6 MEMBER ARMIJO: They are both
7 intergranular cracking, right?

8 MR. WHITE: That's right.

9 MEMBER ARMIJO: So it's pretty much the
10 same.

11 CHAIRMAN SHACK: I mean, highly tortuous
12 compared to a fatigue crack.

13 MR. WHITE: That's right. So the codes
14 have been benchmarked against --

15 MEMBER ARMIJO: IGSCC.

16 MR. WHITE: -- the appropriate type of
17 morphology.

18 MEMBER BANERJEE: Okay.

19 MR. SHAHKARAMI: Okay. Evaluation
20 criteria. Significant discussion has been devoted to
21 the issue of evaluation criteria. For the purpose of
22 the technical report of this project, we have chosen
23 to apply a more limited set of evaluation criteria
24 against which is the available margin, can be assessed
25 and presented.

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1 Let me just explain this. Maybe to get up
2 and explain it would be easier to do that.

3 CHAIRMAN SHACK: The microphone is a
4 problem. You have to have a microphone.

5 MR. SHAHKARAMI: I'm sorry?

6 CHAIRMAN SHACK: You need a microphone if
7 you are going to get up. Can you do it from sitting
8 somewhere, maybe off to the side a little bit?

9 MR. SHAHKARAMI: Yes. That may help.

10 CHAIRMAN SHACK: You might want to sit on
11 the side of the table there so you can look at the
12 screen and still speak into the mike.

13 MR. SHAHKARAMI: So basically what you see
14 here, .25 gpm Mr. Sullivan talked about are enhanced
15 leak monitoring that we have imposed on all PWR.
16 That's where we feel we can detect maybe even below
17 .25 gpm if you look at the leakage that we have
18 experienced. So what we did, we multiplied that by a
19 factor of four to account for any kind of
20 calculational variance to say it is detectable at one
21 gpm. We feel very confident.

22 And then this red curve right here is a
23 leak rate. And on horizontal axis, you see the time
24 after the initial through-wall crack in days and the
25 leakage rate in a gpm and then the stability margin on

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1 the right vertical axis.

2 So if we go to where we detect the one gpm
3 and then go seven days after, we feel very comfortable
4 that in seven days, the operation can take the unit to
5 mode 5. And that really probably happens much earlier
6 than that, but we thought that was reasonable.

7 And if we draw a vertical line from there
8 and look at the inner section of the leak rate with
9 the stability margin with a factor that we use as 1.2,
10 you will see that what it takes from the time you leak
11 to the time that we have concern is a matter of 30
12 days or so.

13 I think that we had only 2 cases if I
14 recall that do not meet the 30 days' duration, but, as
15 I told you, this is the area you are probably going to
16 already be in a mode 5 from an operational
17 perspective.

18 So a big picture of how we set the
19 criteria. Any question about that or --

20 MEMBER ARMIJO: So you say you believe you
21 can detect it in seven days? Well, let's say .25 gpm.

22 MR. SHAHKARAMI: We can detect .25 or
23 less, but we use one gpm as a detectable point.

24 MEMBER ARMIJO: All right. So that means
25 you could detect this one after 30 days. I don't

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1 understand what the seven days is after.

2 MR. SHAHKARAMI: The seven days. Once you
3 get to the one gpm, we feel comfortable that in seven
4 days we would have taken action and take the unit to
5 mode 5.

6 MEMBER ARMIJO: Okay. And then would, of
7 course, come to a stability margin of 1. something,
8 1.6.

9 MR. SHAHKARAMI: Two. 1.2. Is that --

10 MEMBER ARMIJO: At seven days? It's even
11 better than that, isn't it?

12 MR. SHAHKARAMI: But this is constant, 1.2
13 right here.

14 MEMBER BANERJEE: What is that blue point
15 hanging up in the middle there?

16 MEMBER ARMIJO: Yes. See, I don't
17 understand that.

18 MR. SHAHKARAMI: The stability margin?

19 MEMBER BANERJEE: No, no, no. The --

20 MEMBER ARMIJO: That is where they cross.

21 MEMBER POWERS: Where the arrow goes, does
22 this point fall below the stability margin? What's
23 that point?

24 MR. WHITE: That's the evaluation
25 criteria.

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1 CHAIRMAN SHACK: He is looking at how many
2 days it gets them to 1.2.

3 MR. WHITE: That's right.

4 CHAIRMAN SHACK: There to 1.2.

5 MEMBER ARMIJO: But your actual stability
6 margin after seven days is much higher.

7 CHAIRMAN SHACK: Is much higher, but the
8 stability margin is going down, down, down.

9 MEMBER ARMIJO: And you never want to get
10 below 1.2.

11 MR. SHAHKARAMI: That's right because
12 that's the threshold we establish.

13 MEMBER ARMIJO: I understand. And you
14 have other curves that say that it doesn't work out
15 that nice if you don't have that much time. Is that
16 right?

17 MR. WHITE: All except two cases in our
18 matrix show more than 30 days. So this case shows
19 about 45 days.

20 MEMBER ARMIJO: What is your shortest
21 time?

22 MR. WHITE: Pardon me?

23 MEMBER ARMIJO: What case? What is the
24 shortest time?

25 MR. WHITE: We have one case with 22 days

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1 and one case with 11 days. The 11-day case we don't
2 think is not appropriate but assumes a 360-degree
3 flaw. So we looked at additional cases. But the
4 cases they were using to make conclusions start at 22
5 days and go higher.

6 MR. SHAHKARAMI: As I said, though, there
7 are still a couple of cases that are being run, but
8 those are not limited. In other words, we prioritize
9 which ones are the most important. And we have
10 already tackled those.

11 So what is left? We don't anticipate any
12 kind of surprises.

13 MEMBER ARMIJO: If we put error bars on
14 both of these graphs, what would be the uncertainty in
15 that time period?

16 MR. WHITE: That's why we are addressing
17 that. We are doing 117 cases. So by looking at many
18 different parameters and doing sensitivities when that
19 gives us a field for the uncertainty.

20 We also have chosen our sensitivity
21 parameters based on the 5th percentile, 95th
22 percentile values, for example, with the stress
23 intensity factor exponent.

24 MEMBER BANERJEE: These are sensitivities
25 to input parameters from what I understand, geometry

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1 and stuff.

2 MR. WHITE: Yes.

3 MEMBER BANERJEE: What about sensitivity
4 to the model itself?

5 MR. WHITE: We have some of those cases
6 also.

7 MEMBER BANERJEE: So, you know, with all
8 the assumptions that you have made --

9 CHAIRMAN SHACK: This is one of those
10 cases where the conservative model gets you into
11 trouble sometimes because, you know, you guys are
12 bounding the multiple cracks with a big crack, which
13 is good, but that ups my leak rate; whereas, if I had
14 a bunch of little cracks, I would be losing area.

15 My net section would be going down. But
16 I have little short cracks. I wouldn't get nearly as
17 much opening. You know, I suppose I took this crack
18 an split it up into three little cracks. What would
19 it look like?

20 MR. WHITE: We have done that sort of --

21 CHAIRMAN SHACK: Okay.

22 MR. WHITE: -- thing in those cases.

23 MR. SHAHKARAMI: What we have seen, the
24 majority of these cases that we ran, arrest, you know,
25 that the crack is an arrest.

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1 CHAIRMAN SHACK: That's another problem.

2 MR. SHAHKARAMI: Right. So I think you
3 are going to touch on that later.

4 MEMBER MAYNARD: There is a lot of
5 conservatism in the leak rate detection. I mean, it
6 is incredible to think you're not going to find
7 anything until one gpm. I mean, that is going to
8 really --

9 PARTICIPANT: A whole different --

10 MEMBER MAYNARD: In seven days to take one
11 of these to cold shutdown is a lifetime.

12 CHAIRMAN SHACK: Yes. But when I split
13 this sucker up into three cracks, that leak rate is
14 going to drop like a rock. You're going to show me a
15 case where that -- I have looked at three separate
16 cracks, rather than one big long crack. And, you
17 know, I would think I would get a very dramatically
18 different leak rate curve, although the stability
19 margin would look about the same.

20 MEMBER ARMIJO: So you are saying it would
21 be hard to detect but --

22 CHAIRMAN SHACK: It would be harder to
23 detect, but the stability would be going down. I
24 mean, it's those little ligaments that are sort of
25 left to cause problems for leak-before-break analyses.

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1 When I put a big crack in there, that
2 sucker opens up, and it leaks when I keep the
3 ligaments in there and I narrow that crack down but I
4 don't gain a whole lot in the stability margin from
5 that.

6 You have some examples like that. So that
7 is certainly something to be aware of as you go
8 through this analysis, that that bounding crack may
9 not be conservative if you are looking at
10 leak-before-break kind of analyses.

11 MR. WHITE: We try to take --

12 CHAIRMAN SHACK: Try to address that.

13 MR. WHITE: -- solution by looking at a
14 variety of different, starting off with different
15 aspect ratios, a 61 crack, a 21 crack, a 360-degree
16 crack, and then cases where the multiple cracks grew
17 separately and then they combined.

18 PARTICIPANT: But as to Bill's point, do
19 you have any cases where you have penetrating cracks,
20 multiple penetrating cracks, that haven't combined
21 into a single crack?

22 PARTICIPANT: No.

23 PARTICIPANT: Maybe it's something you
24 want to look at.

25 CHAIRMAN SHACK: I think that's a case to

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1 look at.

2 MR. SHAHKARAMI: I mean like in a surge
3 nuzzle, for example, you penetrate. You are not going
4 to get .25 gpm. You are going to get a couple gpm due
5 to the size and the nature of --

6 CHAIRMAN SHACK: Yes. Well, I must
7 confess all of my calculations in my head come from
8 steam generator tubes, which are slightly different
9 geometries than you are dealing with here, but I think
10 the problems still remain that you have to be careful
11 about putting multiple cracks together and bouncing
12 them because it is conservative in some sense, but it
13 is not conservative in a leak-before-break sense.

14 MEMBER MAYNARD: On the leak rate
15 protection, are you only taking credit for what you
16 can measure in the leak rate or does it also take into
17 account other mechanisms available, such as radiation
18 monitors, temperature --

19 MR. SHAHKARAMI: Definitely, definitely.
20 The letter that was sent out by all the utilities and
21 responded to by NRC touched on almost all of these
22 issues. A lot of times we detected not from the leak.

23 MEMBER MAYNARD: Right.

24 CHAIRMAN SHACK: But would you take action
25 without a .25 gpm?

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1 MR. SHAHKARAMI: Definitely. There is a
2 whole systematic output that you go through to
3 evaluate where you are in respect to what you detect,
4 yes.

5 MEMBER ARMIJO: So typically the tech spec
6 limits for unidentified leaks would fall in the .25
7 gpm?

8 MR. SHAHKARAMI: Tech spec is much higher
9 level. Tech spec, technical specification, if I
10 recall correctly, is like two gpm, one gpm.

11 MEMBER MAYNARD: You have one gpm
12 unidentified, ten gpm identified.

13 MR. SHAHKARAMI: On the PWR?

14 MEMBER MAYNARD: PWR.

15 MR. SHAHKARAMI: Yes, yes. PWR is --

16 CHAIRMAN SHACK: Unless you've got leaking
17 steam generators, right? Then you drop it.

18 MR. SHAHKARAMI: Should we move on?

19 CHAIRMAN SHACK: Yes.

20 MR. SHAHKARAMI: Okay. Go ahead and cover
21 the three pages of graphical.

22 MR. WHITE: These are just nine examples
23 of different meshes to show you what they look like in
24 terms of the refinement. We have looked at this
25 explicitly to increase the number of nodes.

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1 The one on the left here is a safety and
2 release nozzle. It's a 360-degree flaw. Then we have
3 that same case growing to a through-wall flaw. And
4 then leaking case 41 happens to be a different safety
5 release nozzle sensitivity case.

6 We have some surge nozzles here: 19B and
7 17B. 19B is predicted to arrest or does arrest in a
8 simulation. And case 17B here is the high moment load
9 case for a surge nozzle. And you can see the long
10 21-to-1 flaw. And that goes through a --

11 MEMBER ARMIJO: What are the situations
12 that cause, the load conditions that cause, a crack to
13 arrest like your 19B? What happened with that crack,
14 why it stopped growing?

15 MR. WHITE: Well, the first thing to
16 realize is that for the axial stress if it's
17 axisymmetric, it has to be self-balancing at each
18 circumferential position.

19 That's very different than the hoop
20 stresses that drive axial cracks. Where that tensile
21 stress is balanced by the base metal, it's upstream
22 and downstream from there.

23 So you don't have to be -- you can have
24 all tensile stresses for a hoop stress. And, in fact,
25 in practice, we have seen the axial leaking cracks.

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1 We have not seen through-wall leaking circumferential
2 cracks except for the Duane Arnold BWR experience,
3 which had different conditions.

4 So to the extent the stresses are
5 axisymmetric, they have to be self-balancing, which
6 means they have to become compressive. That doesn't
7 automatically mean arrest. It depends how much you're
8 pulling on the crack in other areas in tensile stress.
9 But if it becomes significant, compressive enough,
10 then you will see arrest. In fact, in about half the
11 cases we have run, we're getting arrest.

12 Those are more nominal than on the
13 residual stress assumptions. Then we have used more
14 conservative welding residual stress results. So we
15 didn't take credit for the stainless steel weld access
16 to lower the stress. If you don't take credit for
17 that and use that, then we start to get more growth.
18 But in general, we have to tweak the results, our
19 nominal results, in order to make them grow
20 through-wall.

21 If we look at the Wolf Creek experience,
22 we had three different nozzles. They're all showing
23 cracks about 25 percent through-wall. In fact, they
24 are between 22 percent and 31 percent, a very narrow
25 band for plants of that age to find cracks in that

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1 narrow band in different nozzles with different
2 conditions at different piping loads. It seems
3 exceedingly likely that they were all growing very
4 rapidly at the time that they were detected.

5 And it is consistent with what we are
6 seeing now in our welding residual stress analyses and
7 crack calculations.

8 MEMBER ARMIJO: So is it your best
9 estimate that the Wolf Creek indications are arrested
10 cracks?

11 MR. WHITE: If they are, in fact,
12 service-induced degradation, that would be the most
13 likely conclusions. But the stresses became
14 sufficiently compressed up to either greatly slow
15 their growth or to arrest them.

16 MEMBER ARMIJO: I am looking at the two
17 cases and the deformation of the mesh between these
18 two in case 17.

19 MR. WHITE: Yes.

20 MEMBER ARMIJO: Is this a LeGrangian
21 calculation or is it an Eulerian calculation?

22 MR. WHITE: Of the mesh?

23 MEMBER ARMIJO: Right.

24 MR. WHITE: Well, there are different
25 meshing options.

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1 MEMBER ARMIJO: What causes the
2 deformation of the mesher between these two steps?

3 MR. WHITE: It depends on the type of
4 mesher. So this, the crack in the middle is a surface
5 flaw. And that has one meshing algorithm. And this
6 crack over here is a through-wall crack. So the
7 strategy, there are different routines that are doing
8 the meshing because they are different types of
9 cracks.

10 CHAIRMAN SHACK: He's thinking that you
11 are getting a distorted mesh is the thing he is doing;
12 whereas, you are really building that in the geometry
13 of the mesh.

14 MEMBER ARMIJO: So it is an Eulerian mesh?
15 The mesh doesn't deform as you do the calculation?

16 MR. WHITE: As you do the growth
17 calculation, you update the nodal positions on the
18 crack front and then use that and completely remesh it
19 for the next growth step. So there is no memory of
20 what the mesh looked like from one step to the other.

21 CHAIRMAN SHACK: It's an Eulerian mesh,
22 you know, step-wise.

23 MEMBER BANERJEE: It's adjustable.

24 CHAIRMAN SHACK: It's adjustable mesh.

25 MEMBER BANERJEE: It's very hard to do

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1 convergence studies with adjustable meshes. You are
2 going to tell us about your convergence studies,
3 right?

4 MR. WHITE: We have one slide. I don't
5 have other prepared material other than one slide on
6 the time convergence.

7 MEMBER BANERJEE: So what about nodal
8 convergence? You said you had some nodal convergence?

9 MR. WHITE: I don't have a slide on that,
10 but yes, we have looked at that. And we have also
11 done comparisons with EMC², NRC contractor on stress
12 intensity factor results. And we get exact agreement
13 when we do that.

14 MEMBER BANERJEE: He used a completely
15 different mesh?

16 MR. WHITE: Used a completely different
17 mesher and different finite elements, software, and
18 different methodologies. It's completely independent
19 software programs, which gives us very good
20 confidence. And here are some examples of repair
21 cases. So this is another safety underneath nozzle
22 case.

23 MEMBER POWERS: Could you just take two
24 seconds to explain to me a little bit because it is
25 confusing if you have things like a K(17) (b), which is

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1 your label, you have a name for it, and then you have
2 a step.

3 MR. WHITE: Yes.

4 MEMBER POWERS: What is the step referring
5 to?

6 MR. WHITE: So each of these is a time
7 calculation. So we start with an initial flaw. We
8 call that step zero. And then we calculate the stress
9 intensity factors on the crack front, put that through
10 the crack growth rate equation, calculate the crack
11 increment based on a certain time step assumption, and
12 then we have a new crack profile that is larger than
13 at least that one.

14 MEMBER POWERS: If I look on page 18, I
15 see step 10, it looks decidedly more damaged than step
16 15. There's something I'm missing.

17 MR. WHITE: Step 10 after it goes
18 through-wall, we have to reset the program. So,
19 really, we should have labeled that step 15 of the
20 surface wall, and this is step 10 of the complex. So
21 we are just renumbering. We are starting over to
22 renumber once we go through-wall.

23 MEMBER POWERS: Okay. So your stepping
24 number is absolutely useless to me. It doesn't tell
25 me anything, right?

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1 MR. WHITE: No.

2 MEMBER POWERS: It's just there to confuse
3 me.

4 MR. WHITE: Well, we have a draft report
5 that is available that would explain it, yes.

6 MR. SHAHKARAMI: This step corresponds to
7 what is reflected in the report as well.

8 MR. WHITE: Right. That is ten steps
9 after it goes through-wall. Okay. So this is the
10 repair case that shows the crack front being driven
11 through-wall.

12 MEMBER ARMIJO: What page are you on now,
13 20?

14 MR. WHITE: We are on 20.

15 MEMBER ARMIJO: You skipped 19. Is there
16 any reason to --

17 MR. WHITE: We briefly talked about 19.

18 MEMBER ARMIJO: There wasn't much you
19 wanted to say about it. Okay.

20 MR. WHITE: I would just add one more
21 comment. In the middle, you see that there is a thin
22 ligament at the top. When we go through-wall, we
23 assume that any ligament that is less than ten percent
24 deep is instantaneously cracked through. There's
25 locally those sort of ligaments to elastically

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1 collapse, even though globally the crack is stable.

2 So when we punch through from something
3 like the submittal case towards getting a through-wall
4 crack, like on the right, we instantaneously get rid
5 of that ligament. And we see leak rates that can be
6 two and a half, three gallons per minute or more as
7 soon as we break through.

8 So some number of our cases, these surge
9 nozzle cases, we also pay attention to how high the
10 leak rate is initially. It can be detectable from
11 instantaneously.

12 And this just shows that example of how
13 you can get a thin ligament.

14 MEMBER WALLIS: Can you tell me how you
15 increment the calculation? Do you increment C? Is
16 that what you increment? What is the increment as you
17 go from one step to another? It looks as if it's C,
18 delta C.

19 MR. WHITE: It's every point on the crack
20 front. We calculate the normal direction to the crack
21 front. In fact, we grow each individual point on the
22 crack front.

23 MEMBER WALLIS: So you increment the
24 normal direction. That's your step size for the
25 steps?

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1 MR. WHITE: Yes.

2 MEMBER WALLIS: Okay. Because I was
3 puzzled why that was a constant. Then the time is
4 backed out of it somehow?

5 MR. WHITE: Exactly.

6 MEMBER WALLIS: Okay. Thank you.

7 MR. SHAHKARAMI: Let me talk about
8 preliminary results. Again, I am going to reinforce
9 that the draft report was issued already. And I think
10 NRC should have a copy of that and a final report be
11 issued by this month. A lot of these details are in
12 there.

13 All 103 completed cases in a main
14 sensitivity matrix show either they have been
15 arrested, which was about 59 cases, or the crack
16 leakage and crack stability result satisfied our
17 criteria that are presented earlier. Then that was 44
18 cases, generally considerable margin beyond seven days
19 that we established.

20 We also ran several supplemental cases to
21 further investigate potential effect of multiple flaw
22 in a soft assertion. I know that was an issue with
23 the assumption of an initial 360-degree flaw, a
24 conservative approach to address the concern for
25 multiple flaw initiation on growth. I needed to go

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1 back and see what we do in a multi or smaller case,
2 which wasn't really Wolf Creek but to take a look at
3 that.

4 I think you already discussed the surge
5 line and reach back to why we don't think what we have
6 seen is realistic. On the next two pages, we have
7 some examples from Duane Arnold. I don't know if you
8 are interested to go through those or not for the sake
9 of time.

10 Okay. Go ahead. Cover those two.

11 MR. WHITE: This is the most significant
12 experience in light water reactors with
13 circumferential cracking. And so we took the
14 information on how the component was fabricated and
15 what residual stress calculations were performed. And
16 then we ran that through our crack growth model.

17 This just shows the configuration of --
18 what is different here from the PWRs is the presence
19 of a crevice and, of course, the difference of BWR
20 environment.

21 This shows the stress profile was
22 calculated in the -- there was a simple, the blue
23 line, and then this is the curve fit that we assumed.
24 And we started off with a crack that was 360 degrees
25 and 30 percent deep. And then we drew that around.

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1 And this shows the simulated profile. And
2 then it has roughly the same appearance as the actual
3 crack profile. It gives us some confidence that this
4 sort of modeling is consistent.

5 MEMBER WALLIS: Is that the first time you
6 have tried or did you try various things before you
7 agreed?

8 MR. WHITE: Yes. If you try, there is
9 some uncertainty on what the appropriate initial crack
10 size is. You have a crevice here, which complicates
11 the geometry. The actual cracks are starting in the
12 middle here, but we have to model a planar-type crack.
13 So yes, if you try something that's like only ten
14 percent deep and still in the compressive zone, you
15 are going to get a different result.

16 So there is this complication where the
17 actual geometry is very 3-D and our model doesn't work
18 that way, assumes planar flaws. So we can't draw too
19 much from this. That is why we are showing all the
20 details here. But since it is the most significant
21 example, we wanted to try to take advantage of special
22 --

23 MEMBER ARMIJO: If you were to do this
24 calculation for Wolf Creek before the flaw was
25 detected, what would you have gotten?

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1 MR. WHITE: Before? Well, I'm not sure
2 what you mean exactly.

3 MEMBER ARMIJO: I mean, if you had
4 predicted.

5 MR. WHITE: We assumed very small initial
6 flaws and then grew them at Wolf Creek.

7 MEMBER ARMIJO: Whatever information
8 people would have had prior to the point of flaw
9 detection at Wolf Creek, that knowledge base, if you
10 were to apply your model, what would your model tell
11 you?

12 MR. WHITE: Well, in fact, with our
13 nominal welding residual stress, about 20 to 30
14 percent deep, we are getting the rest. And that is
15 what the cracks were found to be. So under our
16 axisymmetric assumption, we seem to be getting
17 consistent results from how deep the cracks were
18 found.

19 Just being able to come up with exactly
20 what was seen depends on what initiated. And that is
21 beyond our ability to do deterministically.

22 MEMBER ARMIJO: Would your model predict
23 at that particular point a Duane Arnold crack would go
24 unable and rupture?

25 MR. WHITE: We have not. We should look

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1 at that. I believe those detailed calculations were
2 done previously and I --

3 MEMBER ARMIJO: Because it actually
4 didn't, right?

5 MR. WHITE: Right. It's stable.

6 MEMBER ARMIJO: It's stable. So it didn't
7 rupture. So we didn't have that. And that's a lot of
8 cross-sectional area that is gone. I just wanted to
9 see if you could use that.

10 MR. WHITE: That's a good point.

11 MEMBER ARMIJO: Okay.

12 MR. SHAHKARAMI: Any more on Duane Arnold?

13 (No response.)

14 MR. SHAHKARAMI: Okay. Let me --

15 MEMBER BANERJEE: Any other experiments
16 you have compared it to other than Duane Arnold?

17 MR. WHITE: Well, there's been a very
18 important study -- it's called MRP-107 -- that the
19 industry sponsored. We made capsules out of alloy-182
20 weld metal and then pressurized them and looked at
21 stress corrosion crack initiation and growth.

22 And what was seen is that the flaws tend
23 to grow more through-wall than around than in the
24 lateral direction. And that is consistent with what
25 has been seen in plants for the weld metal

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1 specifically. And this is more finger-type crack
2 growth.

3 So we can't really use that information
4 directly to try to grow fingers in our model, but we
5 think that that generally shows that the modeling is
6 conservative versus real life that shows more growth
7 in the depth direction than in the lateral direction
8 around the circumference.

9 There aren't a lot of other experiences.
10 The Duane Arnold experience is the most directly
11 relevant experience, but there are other studies that
12 we are using as input.

13 MR. SHAHKARAMI: All right. Our last
14 slide here is what we can draw from our work that we
15 have done. I am going to just restate a couple of the
16 very important issues.

17 The new refinement in crack growth model
18 eliminates the need to assume that the crack should
19 remain in a semi-elliptical growth on the basis of a
20 stress intensity factor at the deepest and surface
21 points.

22 Assumption of semi-elliptical crack should
23 result in a large overestimating of the crack area
24 and, thus, underestimating of the crack stability at
25 the point at which the crack penetrates to the outside

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1 surface.

2 All 51 subject welds are adequately
3 covered by crack growth sensitivity cases that satisfy
4 the evaluation criteria.

5 A large number of crack growth sensitivity
6 cases showed a stable crack arrest prior to
7 through-wall penetration. The area is consistent with
8 the relatively narrow band of relative depth reported
9 for the four largest wall penetrations that vary from
10 23 to 31 percent through-wall.

11 To the extent that the through-wall weld
12 stress profile is axisymmetric, it must be
13 self-balanced -- I think Glenn talked about that -- at
14 the particular circumferential position, meaning that
15 the significant portion of the wall thickness must be
16 in compressive actual weld residual stresses.

17 Two sensitivity cases show a greatly
18 increased time between a leak rate of one gpm and the
19 load margin factor of 1.2 being reached when it is
20 assumed that the piping thermal constraint loads are
21 relieved upon through-wall penetration. These cases
22 confirm the expectation of large benefit if the piping
23 thermal constraint loads are significantly relaxed
24 once the crack goes through-wall.

25 Detailed evaluation tends to support this

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1 kind of behavior, but such relaxation was
2 conservatively not credited in the base assumption of
3 the critical crack size methodology to develop the
4 study that we undertook.

5 This really summarized what we wanted to
6 talk about, give update. And, as I said, we continue
7 to work with the staff on any open issue and
8 definitely the couple of items that were brought up
9 today to go back and see how was that included as part
10 of our study or needs to be included.

11 MEMBER MAYNARD: I don't think the last
12 time we met that all the spring inspections had been
13 done. Have there been any additional inspection
14 findings in taking a look at any of these since Wolf
15 Creek?

16 MR. SHAHKARAMI: Most of the work done so
17 far has been more mitigating than real inspection.
18 The time that it takes and the technology to go do
19 this is not something that a lot of utilities
20 consider. They would rather do it.

21 MEMBER MAYNARD: I understand. I am just
22 --

23 MR. SHAHKARAMI: No.

24 MEMBER MAYNARD: I am assuming that there
25 have been no more indications identified.

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1 MR. SHAHKARAMI: Not on the pressurizer,
2 no. We have seen them on a CRDM on the head. Those
3 pipings we have taken both samples, analyzed that. We
4 understand what drove those but not in this area.

5 MR. SULLIVAN: This is Ted Sullivan from
6 the staff.

7 I don't have a lot of the details, but I
8 am aware of one indication that was found on a surge
9 nozzle at Farley --

10 MR. SHAHKARAMI: Farley was --

11 MR. SULLIVAN: -- that had both an axial
12 -- there was an axial flaw found or indication as well
13 as a single circumferential. The circumferential
14 indication was only about ten percent arc length. And
15 I don't remember the depth. I don't think it was very
16 deep.

17 CHAIRMAN SHACK: I think we have to move
18 on here to maintain the schedule.

19 MR. CSONTOS: There was one more as well
20 in a European plant, but we can't discuss that at this
21 point. And that was a circ indication.

22 MR. SHAHKARAMI: But I thought the
23 question was at the level of Wolf Creek, what the
24 finding was or the question was more general because
25 --

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1 MEMBER MAYNARD: It was a little more
2 general. I mean, are we finding any other
3 circumferential cracks in these areas?

4 MR. SHAHKARAMI: I see. I see.

5 CHAIRMAN SHACK: Thank you very much for
6 your presentation.

7 MR. SHAHKARAMI: Thank you.

8 CHAIRMAN SHACK: A very interesting piece
9 of work.

10 MR. CSONTOS: All right. Good morning.
11 My name is Al Csontos in the Office of Research. I
12 would like to acknowledge the team here at NRC that
13 worked on this project, Ted Sullivan from NRR. We
14 have Tim Lupold and Simon Sheng from NRR and also our
15 EMC² counterparts contractor, Engineering Mechanics
16 Corporation of Columbus, who did the bulk of this on
17 the finite modeling and the development of the model.

18 You have heard a lot about the program
19 from the industry side. I would just like to talk
20 about what we are doing in our confirmatory program.
21 We developed a corollary program that we used to
22 evaluate review, benchmark, verify the industry's
23 results and the quality of their results.

24 We are interacting with the industry
25 representatives at DEI, all sorts of the different

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1 nine plants' representatives, Areva, et cetera, as we
2 saw at the expert panel meeting that they were talking
3 about. Most of these were; in fact, I think all of
4 them were, public meetings. We have been interacting
5 with them.

6 We provided a letter back in March to go
7 over some of our concerns with some of the analysis
8 and some of the beginning parts of the methodology.
9 They have responded, the industry has responded, in
10 the presentations at these public meetings. We have
11 reached an agreement on pretty much all major
12 technical issues related to development of this
13 advanced finite element program and also the
14 sensitivity matrix.

15 I think Glenn was talking about 110 cases
16 or 109 cases they have completed. They have 117 cases
17 that they are looking from this meeting, maybe 118.

18 So we'll go to the next slide. We have
19 already brought this up. We have independently
20 developed the finite element program, advanced finite
21 element program, to do exactly what Glenn said,
22 evaluate the crack all along the crack front, not just
23 at two points in the crack front, with the case
24 solutions.

25 We have also developed separate

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1 independent weld residual stress patterns for the
2 various geometries or the fabrication conditions that
3 have developed with these different nozzles that Glenn
4 talked about.

5 We have also benchmarked -- and I think
6 you mentioned something about this, Bill -- the K
7 solution benchmarking that we had excellent
8 confirmation with industry's results. And these were
9 separate program, separate analysis techniques. And
10 we came up with nearly identical K solutions for
11 arbitrary cracks, complex cracks.

12 Our weld residual stresses, our
13 benchmarking showed good agreement. And what I mean
14 by that is not actual magnitudes. I am looking at
15 trends.

16 You saw the trends for the weld residual
17 stresses. And that is what we have good agreement on.
18 Some of the actual magnitudes may be a little bit
19 different, but the trends are in good agreement, which
20 is what we are interested in because we can do
21 sensitivity of those trends in the magnitudes through
22 the analysis.

23 We have also conducted a review of the
24 fabrication drawings and the records for the nine
25 plants that are scheduled to perform the inspection

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1 litigation in 2008. Those nine plants, we reviewed
2 the fabrication because there were certain issues. We
3 had talked about repairs, but what we were concerned
4 with are, what are those typical fabrication processes
5 that could actually create this 360-degree crack.

6 What we found in the fabrication drawings
7 -- and for certain Westinghouse plants, not all of the
8 Westinghouse plants but for certain Westinghouse
9 plants -- is that they have this backchipping and a
10 360 ID weld.

11 Let me go back to slide 3 to show what we
12 are talking about here. What we have here -- I will
13 just use this one on the right. For about four or
14 five days, Westinghouse plants, what is done is that
15 they have these welded up.

16 And the lands, which are the points where
17 the two materials meet and they put the root pass
18 around --

19 MR. SULLIVAN: Underneath the red.

20 MR. CSONTOS: Underneath the red right
21 there. That was backchipped, which basically means
22 they machined out about 10 to 15 percent of that ID
23 and rewelded back in. The reason for that is that
24 they thought that they couldn't pass the inspection
25 criteria for that root pass.

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1 And so that typical fabrication process
2 was a --

3 MEMBER ARMIJO: It gives you 360 degrees
4 around?

5 MR. CSONTOS: Yes, right. And it's a 360
6 all the way around. And that's where in our initial
7 Wolf Creek scoping study we had a 360 ID tensile
8 stress that we had placed into the model and to show
9 we would get this how many cases, 20 out of 24 for the
10 refine, showing no time between leak and the rupture.

11 And we were criticized for having that 360
12 weld residual stress in there because it was
13 axisymmetric. It was non-realistic is what we were
14 told. And what we found is that for about a third --
15 well, half of the cases for these nine plants, that
16 was the case. I mean, they have the typical
17 fabrication process that does this backchipping and
18 reweld.

19 And for the surge line, there is actually
20 an additional Phillip weld that goes on. So that is
21 even maybe 20 percent. I don't know. Is it 15, 20,
22 25 percent? Somewhere in that neighborhood of the ID.
23 And that produces 360 tensile ID stresses. And that
24 is what we were concerned with.

25 The repairs were additionally another

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1 concern on top of that. So that is the fabrication
2 information that we obtained that really drove our
3 concerns. And so that was something that we were
4 interested in with this fabrication review.

5 Another corollary part to this was that
6 the safe end -- again, let me go back. What we found
7 was that that process produced tensile ID stresses,
8 but placing the safe end weld here actually reduces
9 that tensile stress considerably.

10 And so some of the results I will show are
11 with and without that weld right there, that stainless
12 weld right there. That reduces the tensile stresses
13 at this 360 ID weld.

14 MR. RUDLAND: That's depending on the
15 length of the safe end, of course.

16 MR. CSONTOS: That's right. That's right.
17 There is some sort of attenuation that goes on,
18 however far away it is. For the ones that we were
19 concerned with with the Westinghouse plants, those are
20 the ones that are about two and a half, three inches,
21 I think, --

22 MR. RUDLAND: Yes, yes.

23 MR. CSONTOS: -- 2.2, something along
24 those lines. And so in that case, we have run cases
25 with and without --

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1 MR. RUDLAND: It's a local bending on the
2 pipe. Local bending caused the ID stresses to g
3 compressive farther upstream there.

4 MR. CSONTOS: So that was the fabrication
5 information that we reviewed and confirmed the
6 industry's information on. That drove a lot of our
7 cases. All that information that we just provided,
8 the loads, weld residual stresses, all that was placed
9 into the modeling, as Glenn talked about.

10 We are also engaged right now in
11 developing a validation of our weld residual stresses.
12 And that validation at this present time is through an
13 EU report that was done on a round robin study to look
14 at weld residual stresses and doing a mockup and doing
15 some neutron diffraction measurements and then
16 comparing those to modeling results.

17 NRC has had one of our contractors,
18 Battelle, run that. And it's come about similar to
19 what the European Union has shown.

20 MEMBER ARMIJO: So is that completed, that
21 --

22 MR. CSONTOS: That part is completed from
23 another contractor. EMC² is running a lot of cases
24 right now. And so they are starting that or they have
25 started. You will be getting that soon, right?

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1 MR. RUDLAND: At the end of the month.

2 MR. CSONTOS: Yes. So we will be getting
3 those results. And I know the industry is working on
4 it as well.

5 CHAIRMAN SHACK: What is this mockup
6 again? It's a mockup of this weld or it's a butt
7 weld?

8 MR. CSONTOS: It's a butt weld. And the
9 butt welds are just I think two stainless pipes. And
10 they do a butt weld on it. And that's what they have
11 modeled.

12 MR. RUDLAND: It's a carbon steel,
13 stainless steel, but it's a stainless steel weld and
14 not an Inconel weld.

15 MR. CSONTOS: 309, I believe. So that's
16 what the Europeans are using in terms of --

17 CHAIRMAN SHACK: Where did they do the
18 neutron diffraction measurements?

19 MR. RUDLAND: Where did they do them?

20 CHAIRMAN SHACK: Yes. Missouri or --

21 MR. RUDLAND: I'm not even sure. It's in
22 the report, but I don't remember off the top of my
23 head. They did some deep hole drilling also, I think.

24 MR. CSONTOS: One case, yes. But for the
25 most part, it's neutron. And we're worried about

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1 trends because we can manipulate to our sensitivity
2 case. We can evaluate different magnitudes. So the
3 trends are what we are most concerned with from those
4 analyses.

5 CHAIRMAN SHACK: Just on that welding
6 residual stress, when you do all of these geometry
7 things, does it really make a difference if you vary
8 things like heat input and yield strength of the weld
9 material? Does that have a big impact in itself?

10 I mean, I never see those varied or any
11 kind of --

12 MR. RUDLAND: Well, the yield strength.

13 CHAIRMAN SHACK: Would.

14 MR. RUDLAND: Yes. He didn't put, really,
15 is driven by the procedure that you particularly use.
16 You know, a lot of times we are making estimations,
17 axisymmetric estimations of these things. And so we
18 input the E to melt the size bead that we are
19 approximating.

20 If you are doing a moving arc type of
21 analysis, then yes, that will affect it. The heat
22 strength is going to affect more because the
23 magnitudes are on the order of yield strengths.

24 MR. CSONTOS: And the number of passes.

25 MR. RUDLAND: That's right, passes.

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1 MR. CSONTOS: When you finally review the
2 reports that the industry provided and we provided,
3 you will see a difference in how we develop our weld
4 residual stresses modeling it. You'll see more
5 passive with ours.

6 MR. RUDLAND: We make different
7 assumptions than the industry did on passes and --

8 MR. CSONTOS: Right. So for all of these
9 cases, when we did the independent finite element
10 development, the code development, as well as the weld
11 residual stresses, you will see there are substantial
12 differences between the two.

13 So we have broken down the advanced FEA
14 project into two parts: phase 1 and phase 2. Phase
15 1 is reevaluating the scoping analysis that was done
16 back in November of '06 that Ted discussed earlier.

17 We did that for the relief line
18 specifically. We didn't want to go through all of the
19 different cases there, same some time. But we went
20 over the relief line. And I'll show some results on
21 that.

22 Bottom line, we got good agreement with
23 the industry. I'll show you a video here, the results
24 between the two. The difference, what Glenn had
25 mentioned, they had arrest. All right. That was

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1 because they had that stainless steel weld that they
2 placed into the weld residual stress analysis.

3 What I will show is when we don't have
4 that stainless steel weld. And we will show how the
5 crack propagates and grows. With the stainless steel
6 weld, on our analysis, we get the same results as the
7 industry. We get crack arrest. Okay?

8 And so bottom line from this work was that
9 we get margin out for those cases and the relief line
10 that we showed that we didn't have margin that had
11 been with this new advanced software that changes the
12 assumptions of a semi-elliptical or crack growing to
13 whatever shape it wants.

14 We also have a phase 2 parametric
15 sensitivity work. That is what Glenn brought up. We
16 --

17 CHAIRMAN SHACK: So you are starting from
18 the actual Wolf Creek geometries, rather than the
19 industry, which sort of seems to use the nominal
20 geometry. Is that --

21 MR. CSONTOS: No.

22 MR. RUDLAND: Both.

23 CHAIRMAN SHACK: You did both?

24 MR. RUDLAND: Phase 1 work was the Wolf
25 Creek geometry. And the industry did the same thing.

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1 CHAIRMAN SHACK: Oh, okay.

2 MR. RUDLAND: Phase 2 is the more generic.

3 MR. CSONTOS: For the phase 2 portion of
4 it, nozzle geometries, loads, everything is to those
5 nine plants that are remaining for phase 2. Phase 1
6 is just reevaluating the Wolf Creek-specific
7 information: loading, nozzles, geometries.

8 CHAIRMAN SHACK: Is anybody growing
9 multiple cracks unlinked?

10 MR. CSONTOS: We have done that. It's
11 very tentative in terms of a bottom crack. What we
12 have done is we have taken occasions going into the
13 phase 2 portion of this.

14 But we have taken a pipe or where have --
15 if I could have my schematic -- and we have a bending
16 moment on it and we have a crack, instead of having it
17 on the top, which is where I think we have with a
18 maximum bending moment, that the industry has placed
19 the crack up here.

20 We have also run a case where the crack is
21 on the bottom, where it has the least bending moment
22 or are compressive. And what we get is a crack that
23 grows and comes out at about 30 degrees that goes
24 through-wall at 30 degrees.

25 And so that symmetry plan if you take a

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1 look at that, it's on both sides. So we have two
2 flaws coming out at the top. And that is the only
3 case that we have run so far.

4 MR. RUDLAND: But the software itself
5 cannot handle independently multiple --

6 MR. CSONTOS: Cracks.

7 MR. RUDLAND: -- multiple cracks growing.

8 MR. CSONTOS: That would be another
9 revision, another advanced advanced FEA code.

10 So I will come back to the phase 2 in a
11 second. Let me go to the video here. This is a
12 video. Again, this is without the stainless steel
13 weld. This is our results from the phase 1 work
14 comparing the original scoping study, Wolf Creek
15 relief line case, with our advanced FEA software. Why
16 don't you run the scoping study?

17 This is what we saw with the scoping
18 study. And you can see the crack grows. What we're
19 doing here, we are evaluating the crack at this point
20 and at that point. And the crack grows in a
21 semi-elliptical way. And just at that point, it
22 ruptures before it leaks.

23 In this case, we are getting the crack to
24 grow along the entire every node that's there to grow
25 wherever the K is growing. And that's basically what

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1 the industry is doing as well. We just put all the
2 time steps in that imation.

3 And you can see here that the crack grows
4 360 and then the bending moment throws the crack or
5 pushes the crack through-wall at the highest bending
6 moment there and then the crack grows around. So we
7 have a leakage.

8 This is, again, the case. There was no
9 stainless steel weld there, safe end weld.

10 MEMBER ARMIJO: So residual stress alone
11 is not sufficient to take it through-wall? It runs
12 out of stress?

13 MR. RUDLAND: No. And the problem again
14 is because the axial stresses need a balancing
15 thickness. And so there is going to be a point where
16 they go compressive. Because of that, if there are no
17 other loads, it is going to arrest.

18 MR. CSONTOS: And that is what happens.
19 When you put the stainless steel safe end weld on
20 there, which is a realistic assumption to use, then
21 you get crack arrest. And this crack stops it.

22 MR. RUDLAND: And you see on the bottom
23 side the crack has arrested basically in the thickness
24 correction. That's because of that, for that reason.
25 But it was driven around circumference on the ID

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1 surface by the ID tensile residual stresses.

2 MR. CSONTOS: Which from that fabrication
3 process, that backchipping and ten percent ID 360
4 weld, that is what is driving that crack from the weld
5 residual stresses? Those kinds of stresses are
6 driving that crack 360? Okay.

7 So that was our phase 1 work. And, again,
8 we had agreement with industry on the phase 1. That
9 was done a month or two ago. And the phase 2 work is
10 ongoing still.

11 The industry has looked at those nine
12 plants. We have developed a list of all of the
13 plant-specific information that is required to run
14 this analysis. Industry is running around 117, maybe
15 118.

16 We right now have 20 cases run. We are
17 approximately going to run about 25. So we will
18 probably have another five or maybe more depending on
19 when we see or less, I guess, but we are looking a
20 specific issues. And I will get to those.

21 Can you go two slides forward? So of
22 those 20 that we have run so far, 4 have been the base
23 cases from the safety relief line, 3 have been from
24 the spray, and 3 from the surge lines.

25 We have added some modifications to it,

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1 changing the initial crack shape, sizes, different
2 weld residual stresses, locations. And that is where
3 we get the additional ten cases.

4 We will probably run several more because
5 when we get a case, we find the same issue when we
6 have -- we have a couple of cases showing arrest that
7 confirm the industry's arrest cases. We have focused
8 in on those cases that they have shown substantially
9 less time, those 11 days and 21 days, I believe. And
10 we have focused in on those. And then we have run a
11 sensitivity study within a sensitivity study to see
12 what parameters affect those results.

13 CHAIRMAN SHACK: But this is basically
14 axisymmetric residual stresses with a bending moment
15 to --

16 MR. CSONTOS: Right, right.

17 CHAIRMAN SHACK: -- drive it through the
18 wall.

19 MR. RUDLAND: And because of the
20 non-axisymmetric residual stresses, we confirmed that
21 there will be leakage with a lot margin.

22 MR. CSONTOS: Right. That's right. And
23 we are also using industry's weld residual stresses as
24 well as ours.

25 MR. RUDLAND: But realize that when we

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1 talk about axisymmetric residual stresses for these
2 processes with this backchipping and this fill-in
3 weld, you are going to get axisymmetric residual
4 stresses in the absence of any weld repairs.

5 MR. CSONTOS: Right, right. So, again, we
6 reserve the right to reevaluate more cases.

7 MEMBER WALLIS: How well do you know this
8 bending moment?

9 MR. CSONTOS: Very well, I think. The
10 industry provided it through the different plants.
11 Different plants have --

12 MEMBER WALLIS: There is evidence? And it
13 has been measured and so on?

14 MR. RUDLAND: Now, these are --

15 MR. CSONTOS: Design.

16 MR. RUDLAND: -- design load.

17 MR. CSONTOS: Yes.

18 MR. RUDLAND: These are design.

19 MR. CSONTOS: We were told --

20 MEMBER WALLIS: Field test design, right?

21 (Laughter.)

22 MR. RUDLAND: That's right.

23 MR. CSONTOS: Glenn, can you answer that?

24 MR. RUDLAND: There have been some
25 sensitivity cases done on geometry between design and

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1 aspects, but --

2 MR. WHITE: I think I mentioned before we
3 just take the reported design load as an upper bound
4 and --

5 MEMBER WALLIS: Is that the way it was
6 actually made?

7 CHAIRMAN SHACK: Well, I think you could
8 probably assume that the assumption which is an upper
9 bound is a pretty good one. It's a question of how
10 much lower it is when it is providing the
11 non-axisymmetry that you want.

12 The code was set up to be conservative by
13 making sure you calculated it to be an upper bound.
14 In this case, you want the lower bound bending moment.

15 MR. CSONTOS: And we held a public meeting
16 on this issue of loading. And we found that the ratio
17 between bending and membrane loading is a big player
18 in whether or not you get through-wall leakage or you
19 get the circumferential crack to grow and possibly
20 grow in leakage to rupture.

21 So what we have done is we have evaluated
22 those bending-to-membrane ratios and come up with
23 those cases. And we have basically bounded our cases
24 to those cases that we are concerned with.

25 Ones that have high bending moments, like

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1 Wolf Creek, we are not too concerned with. We see
2 that those cracks would probably go through-wall
3 before it would go to rupture. It's those ones that
4 don't have a high bending moment that the residual
5 stresses will then drive the crack to a 360 and maybe
6 possibly grow it to a potential -- you have to have
7 enough to generate to make the crack grow past that
8 weld.

9 There's a weld residual stress weld. That
10 is what Glenn was talking about where you have this
11 arrest. So it's a fine line between what you get with
12 arrest to then hit a through-wall crack or to a crack
13 to rupture.

14 MR. RUDLAND: I think the industry did a
15 good job of bounding that by choosing the moments, the
16 maximum from the design and then the minimums just
17 above the arrest to try to bound that result in both
18 cases.

19 MR. CSONTOS: So we are running
20 sensitivity cases with all of that information, the
21 design information.

22 We don't have much time. So the bottom
23 line from this work, the phase 2 work, for the limited
24 cases that we have evaluated at this point, we have
25 evaluated probably a dozen cases yesterday because we

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1 just received the report yesterday afternoon. I think
2 it was 5:00 o'clock or 6:00 o'clock.

3 So we have been evaluating those cases.
4 And for right now, generally we have good agreement
5 with the industry in terms of leakage rates, stability
6 margins, et cetera.

7 This goes into what we received so far.
8 We received partial results of the 117 cases. I don't
9 remember exactly how many of them, but it was just
10 tables. And that was on Saturday. That's what we
11 used to review some of the cases that we have looked
12 at that we have evaluated from NRC's perspective.

13 We received the draft report yesterday
14 afternoon. And we will be providing comments in
15 public forums to the report tomorrow as well as next
16 Tuesday. We will have public webcasts and
17 teleconference.

18 We will provide our comments and also
19 additional cases if we feel that there need to be
20 additional cases run; for example, this flaw on the
21 bottom that we have looked at. And they will provide
22 a report. They are in line to provide a report July
23 31st to us.

24 NRC's contractor will have a draft final
25 report on our evaluation on the 31st as well, but we

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1 will have updates to that in early August. We will
2 have a public meeting in early August, August 9th, I
3 believe, to wrap this entire project hopefully up at
4 that time. We will prepare, NRC staff will prepare,
5 a safety evaluation or safety assessment by August
6 31st.

7 And do you want to mention the last one?

8 MR. SULLIVAN: Well, we'll be using that.
9 I mean, we haven't reached conclusions yet. We just
10 got the report last night. And we have not really
11 finished all of our analyses, as Al has described, but
12 our plan is to wrap everything up by the end of August
13 and in the safety assessment come to the conclusion
14 that we come to regarding whether there is a
15 reasonable assurance finding that we described earlier
16 in this presentation, starting around 10:30. And we
17 will be issuing that in letters to each of the nine
18 plants.

19 There is no need to change the CALS one
20 way or the other. The CALS have a commitment that is
21 flexible. And we will be, like I said, making those
22 conclusions in August.

23 MR. CSONTOS: Okay. So, in summary, we
24 have developed an independent corollary program to
25 evaluate the industry's results. Phase 1 showed good

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1 agreement between our results and industry's results.
2 We show margin now for the relief line case that we
3 have evaluated, unlike what we had in the scoping
4 study.

5 For the limited cases that we evaluated in
6 the phase 2 --

7 CHAIRMAN SHACK: When you say you have
8 shown margin there, I mean, what were the actual times
9 between detectable leakage and failure?

10 MR. RUDLAND: For the Wolf Creek case?
11 Oh, boy. It was much longer than 30 days.

12 CHAIRMAN SHACK: Okay. So it was ample?

13 MR. RUDLAND: It wasn't days. Yes, it was
14 ample.

15 MR. CSONTOS: And, again, if we have the
16 more realistic case where we are with the same, we get
17 arrest. And we are reviewing the phase 2 results from
18 the industry, the industry results, the report, and we
19 have not yet reached any conclusions.

20 MEMBER ARMIJO: You said that there were
21 indications found at Farley?

22 MR. SULLIVAN: Yes.

23 MEMBER ARMIJO: Is there any way to use
24 that information to verify your code or your model?

25 MR. SULLIVAN: I'm not sure how we would

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1 do it.

2 MEMBER ARMIJO: I mean, assume Farley was
3 one of the plants that was planning to do this next
4 year.

5 MR. RUDLAND: We would have to take a boat
6 sample to get an actual measurement of the --

7 CHAIRMAN SHACK: I would sure like to see
8 that.

9 MR. RUDLAND: And, you know, that kind of
10 stuff probably is not so realistic.

11 MEMBER ARMIJO: But you don't have that
12 information for the nine plants either.

13 MR. SULLIVAN: I think one thing that was
14 beneficial for Farley that wasn't done in the Wolf
15 Creek case was that they used a qualified inspection
16 technique to measure the depth of the flaw.

17 In the Wolf Creek case, they used a -- we
18 talked about this in February, not that I would expect
19 everybody to remember all this stuff, but we have been
20 living it day in/day out since then.

21 In the Wolf Creek case, they used a manual
22 technique, which was not qualified for depth sizing.
23 It was qualified for detection and length sizing.

24 In the Farley case, through a sort of
25 complicated chain of events, they used a phased array

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1 technique, which is set up on kind of a
2 semi-automatic. It's semi-automatic in the sense that
3 the probes are set up on a track, but they are moved
4 manually. And the data is recorded, which was not
5 done in the Wolf Creek case, which is also why we are
6 a little bit ambiguous when we try to answer questions
7 on exactly where the flaws were relative to the butter
8 of the safe end in the Wolf Creek case.

9 So there is more data in the sense that we
10 know much better. We believe we understand much
11 better what the length and the depth of the flaw is,
12 but I guess I would say that it's kind of bounded by
13 the analyses that were done here in the sense that we
14 assumed initial flaws about the same size, sizes that
15 I think closely approximated over bounding over
16 farther.

17 MR. RUDLAND: To truly benchmark these, we
18 need at least two measurements, right? And one
19 measurement is a little difficult to benchmark. The
20 initiation is just difficult to understand, difficult
21 to predict.

22 MR. CSONTOS: The only place that we could
23 really evaluate the Farley would be in the
24 probabilistic analysis. The industry had not included
25 that into their draft report, but that is coming, I am

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1 told.

2 And that may be a part of their
3 probabilistic or they have taken all of the existing
4 flaws that have been found. And they placed them into
5 a probabilistic analysis to see.

6 They can go into it in more detail, but
7 it's circumferential indications, how large they were.
8 And they have been running a probabilistic type of
9 analysis to evaluate statistically what the
10 probability is for something like this to happen to
11 those nine plants.

12 MEMBER BANERJEE: So is the industry model
13 and your model -- the basis of this is you do the
14 stress/strain analysis? But then the crack tip
15 propagation itself, is that model very similar in the
16 two?

17 MR. RUDLAND: The methodology is the same.
18 It was developed separately, but the methodology of
19 taking the driving force along the crack front, the
20 propagating crack perpendicular to the crack front, is
21 the same.

22 MR. CSONTOS: That's an established
23 fraction --

24 MEMBER BANERJEE: And is it the same
25 relationship being used or is it a different

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1 relationship?

2 MR. RUDLAND: I'm not sure what you mean.
3 The growth relationships are the same.

4 MEMBER BANERJEE: Empirical.

5 MR. RUDLAND: Yes, yes. The crack growth
6 relationships are the same.

7 MEMBER BANERJEE: The empirical
8 relationship is the same that you are using.

9 MR. RUDLAND: Yes, yes. The MRP-115
10 growth laws are the same.

11 MR. CSONTOS: Right. That's our best
12 basis of data.

13 MEMBER WALLIS: When a big pipe like this
14 breaks, is it usually just one crack that grows or as
15 the crack grows and the stresses develop, do other
16 flaws begin to grow? And what is the experience with
17 the breaking of large pipes, that you get multiple
18 flaws growing or do you get --

19 MR. CSONTOS: I think Bill mentioned it
20 earlier.

21 MR. RUDLAND: Stress corrosion cracking --
22 correct me if I am wrong -- is a multiple crack
23 phenomenon.

24 MEMBER WALLIS: Yes, it would be. Right.

25 MR. RUDLAND: And so --

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1 MEMBER WALLIS: But you can't model that.

2 MR. RUDLAND: That's correct.

3 CHAIRMAN SHACK: Under his retarded growth
4 through the wall, which is his axisymmetric case and
5 his most likely one, you will get multiple
6 initiations, but they will all kind of link up. And
7 so he --

8 MR. CSONTOS: And that is exactly why we
9 use the 360.

10 CHAIRMAN SHACK: That's why he uses the
11 360.

12 MR. CSONTOS: The 360, ten percent of flaw
13 shape, initial flaw shape, bounds all the multiple
14 cracks because what we say is that with the weld
15 residual stresses --

16 MEMBER WALLIS: How do you deal with the
17 multiple flaws?

18 MR. CSONTOS: Right. And you have
19 multiple flaws, but what we found is that the crack
20 shape and the final crack shape were fairly
21 insensitive when we have this weld residual stress
22 pattern that we have developed with the fabrication of
23 this last pass ID 360 weld, that typically, even if
24 you have different shape flaws, it was insensitive at
25 the final stage because they would grow 360 because of

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1 the weld residual stresses.

2 MR. RUDLAND: At leakage, yes.

3 MR. CSONTOS: Right.

4 MR. RUDLAND: The flaw shape of that
5 leakage was the same. Whether you started out with a
6 short regular flaw or a 360-degree flaw, you ended up
7 with about the same shape.

8 CHAIRMAN SHACK: But there's still a
9 question in my mind whether I can get multiple flaws
10 to go through-wall without linking up first and
11 reducing my leakage. I don't think that's the case in
12 this particular one, but if you were looking at a more
13 general kind of situation.

14 PARTICIPANT: It would be hard to do,
15 Bill.

16 MR. RUDLAND: Leak at the highest moment,
17 location probably, right, first, whether or not they
18 are going fast enough to link up before that first one
19 leaks --

20 CHAIRMAN SHACK: Right. That is the
21 question. You know, when you initiate them randomly
22 around the thing, will they -- and, again, it's a
23 balancing thing in the residual stresses. There's a
24 family of residual stresses that will drive them
25 through the wall. There's a family that will arrest

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1 them, which is probably the most likely case and then
2 the one that might cause you problems.

3 MEMBER WALLIS: What's observed when pipes
4 leak before they break? Did they squirt out through
5 one hole or did they ooze out through lots of holes?

6 MR. SULLIVAN: I think we don't really
7 have that much experience, but the experience that we
8 have would say --

9 MEMBER WALLIS: We don't have experience.

10 MR. SULLIVAN: -- it leaks through one --

11 MR. RUDLAND: If we look at Duane Arnold,
12 which is a 360-degree crack, it was just one location
13 that it leaked out.

14 MEMBER WALLIS: I am thinking from other
15 industries. I mean, there must be situations where
16 pipes ooze or --

17 MEMBER ARMIJO: In the BWR thing, they
18 were just single leaks.

19 MR. SULLIVAN: I think the closest
20 experience we have is stress corrosion cracking in
21 boilers. And, you know, that probably was attacked
22 pretty aggressively. So it didn't go on for years and
23 years before weld overlays and that sort of thing were
24 applied, but from what I know of the data, which isn't
25 that much, I was -- this is all sort of secondhand

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1 from the same questioning I have been asking.

2 But they did see 360-degree ID cracking on
3 the ID for some of the stuff they cut out. And the
4 leakage points were just at one location on the OD.

5 MR. RUDLAND: I saw a photo of the North
6 Anna head leakage crack that was on the ID of the
7 J-weld. And it had a location where it was actually
8 -- it looked like two cracks that had a small ligament
9 between, between it along the entire length of the
10 crack. In that particular case, it was looking like
11 it was a full crack, but that ligament may have been
12 actually limiting the crack opening displacement.

13 CHAIRMAN SHACK: But, you know, I did lots
14 of BWR pipe cracks in the good old days. In the
15 four-inch lines, it was typically -- you know, it went
16 through-wall pretty quickly because, again, you had
17 the bad kind of welding. You gave a nice local
18 stress.

19 And it would just, you know, sort of -- in
20 the bigger pipes, where it was really harder to
21 mistreat the weld so badly, you would get a more
22 axisymmetric situation. So you would get lots of
23 little cracks, but they would tend to arrest as you
24 went through the wall.

25 MR. RUDLAND: And the BWR is a sensitized

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1 region a lot smaller than in the PWRs. And the
2 alloy-182 welds is a lot longer region. So you get
3 more of a probability of getting global cracks.

4 CHAIRMAN SHACK: Right. You have a much
5 bigger place to kind of put things around.

6 Any further comments or questions? It was
7 a very good -- you didn't show the --

8 MR. RUDLAND: No.

9 CHAIRMAN SHACK: I love that graph. I
10 mean, you know, it looks like you misplotted the data.
11 At least get this agreement. I mean, I couldn't
12 believe that if he did the calculation one day and he
13 did it the next day he wouldn't get agreement that
14 good.

15 MR. CSONTOS: We had identical agreement,
16 almost identical, for the K verification.

17 MEMBER BANERJEE: You had better not show
18 that.

19 PARTICIPANT: Oh, yes. You don't want to
20 show that.

21 MR. CSONTOS: I actually had it. I
22 actually had it in Rev. 1 of this presentation.

23 MR. RUDLAND: It was done in different
24 states by different people, different codes.

25 CHAIRMAN SHACK: Thank you very much. We

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1 are going to recess for lunch. And we are due back at
2 -- 1:15 is close enough. You can have a shorter lunch
3 today.

4 (Whereupon, a luncheon recess was taken
5 at 12:23 p.m.)
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A-F-T-E-R-N-O-O-N S-E-S-S-I-O-N

(1:17 p.m.)

4) ACTIVITIES IN THE SAFEGUARDS AND SECURITY AREAS

CHAIRMAN SHACK: Back into session. Our next topic is "Activities in the Safeguards and Securities Areas." And Mario will be getting us through that.

4.1) REMARKS BY THE SUBCOMMITTEE CHAIRMAN

VICE CHAIRMAN BONACA: Yes. The reason for the update is that there are many activities going on in the securities and safeguards area. They are mostly led by NSIR.

We are only familiar with some of those activities, for a number of reasons; one, first of all, that there be waivers of SCRS reviews. So there are activities that don't come to our review, period.

Also, there has been from the beginning pretty much of a directive from the Commission that we will not get involved in issues to do with design basis threat, also for some issues of the kind.

And, third, of course, this is an area where, you know, need to know is a critical element. So unless we are informed, we just don't know what is going on. So occasionally we get surprised by the sudden request for a review.

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1 And I thought that would be timely now
2 since we haven't met with NSIR in a year or more to
3 have an overview of what has taken place and then a
4 sense of what is coming our way so that we can prepare
5 ourselves, put it down on a schedule literally our
6 review as participation, as leaders.

7 So, with that, I will turn it over to you,
8 Mario, or to Scott.

9 4.2) BRIEFING BY AND DISCUSSIONS WITH
10 REPRESENTATIVES OF THE NRC STAFF

11 MR. MORRIS: Yes. I appreciate that. And
12 we certainly welcome the opportunity to give you --

13 VICE CHAIRMAN BONACA: Today we don't need
14 any details or anything that would require a special
15 room. I mean, it would be more like an overview of
16 what is going on.

17 MR. MORRIS: Right. We are prepared to
18 give you a high-level overview of the things that we
19 have done in nuclear power. We are going to restrict
20 the discussion to power plants, I guess, but a lot of
21 these things apply more broadly.

22 First of all, I am Scott Morris. I am the
23 Deputy Director of the Division of Security Policy in
24 the Office of Nuclear Security and Incident Response.
25 And I have been associated with a lot of these things,

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1 all the way back to 2002.

2 With me is Bonnie Schnitzler. She works
3 in one of the branches that are in my part of our
4 division. And her focus is principally rulemaking
5 now, but certainly she has a lot of experience, both
6 on the regulatory side but also as a former employee
7 of TVA in the security arena with the cognizance of
8 the security of a number of TVA power reactor
9 facilities. So she can give you a fairly unique
10 perspective on what we have done.

11 Quickly, obviously we have done a whole
12 lot of things in nuclear security since 2001 and
13 particularly since the office was formed in April of
14 2002. We couldn't possibly hope to get into any real
15 detail in the time that we have allotted.

16 So what Bonnie is going to do is just walk
17 you through sort of the high-level summary of things
18 that have taken place, the things that are currently
19 on our plate, and things that are going to involve
20 some interaction with the ACRS as we move forward,
21 particularly since some of the security requirements
22 that we have proposed and the regulatory guidance that
23 we're developing to support those requirements touches
24 on safety, touches on plant operations. And so
25 hopefully at the end of this discussion, you will have

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1 a better appreciation for what those things are.

2 And, with that, we will turn it over to
3 Ms. Schnitzler.

4 MS. SCHNITZLER: Thank you.

5 As Scott said, I am from the Division of
6 NSIR, Reactor Security Branch. And I am here to
7 provide you an overview of security action since 9/11,
8 kind of focusing on the rulemaking and guidance that
9 has gone on.

10 I am going to talk to you a little bit
11 today about the actions the agency has taken, talk
12 about the Energy Policy Act and how that has impacted
13 security, look at the objectives that NSIR wants to
14 achieve in rulemaking and the specific rules to
15 accomplish our objectives. I will walk you through
16 the guidance that is in development that supports
17 these rulemakings. And, lastly, we will look at
18 specific rules and guidance where we think we need
19 ACRS review.

20 Please feel free to ask questions as we go
21 along. If the questions step into a safeguards arena,
22 I will ask to save that until the end. And then if we
23 want to do something in a smaller group at the end,
24 that would be appropriate. Is that okay with
25 everybody? Great.

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1 Okay. The requirements for power reactor
2 security are established in Part 73, Code of Federal
3 Regulations. And at the base of those requirements is
4 the design basis threat, or DBT.

5 The DBT is basically the largest
6 reasonable threat against which a regulated private
7 security force should be expected to defend under
8 existing law.

9 This DBT is informed by threat information
10 that the agency receives. It is reviewed
11 periodically. And a report is put forward to the
12 Commission and determination is made whether the DBT
13 stays where it is or moved up or changed, whatever has
14 happened to it.

15 MEMBER CORRADINI: It is different for all
16 different facilities.

17 MS. SCHNITZLER: It is different for
18 different types of facilities. Yes, sir.

19 MR. MORRIS: There are two design basis
20 threats. There is one for power reactors. And that
21 is associated with radiological sabotage. And there
22 is another set of threat characteristics that apply to
23 category 1 fuel cycle facilities. And that is not for
24 radiological sabotage exclusively but also for theft
25 and diversion of the nuclear material. So it's a

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1 little bit more of a robust set of threat
2 characteristics.

3 So there are only two DBTs. The one that
4 Bonnie is talking about is the one that is for
5 radiological sabotage that applies to all power
6 reactor facilities.

7 MEMBER CORRADINI: And non-power reactors,
8 I assume?

9 MR. MORRIS: No. Non-power reactors fall
10 under a different set of regulations, 73.16 and 73.67.

11 MS. SCHNITZLER: Okay. Following 9/11,
12 there were many security actions, but the most
13 important and comprehensive was the issuance of
14 orders. The interim compensatory measures that was
15 the first order that was issued provided immediate
16 security measures for nuclear plants to implement some
17 immediate security actions that were taken.

18 VICE CHAIRMAN BONACA: That was the
19 B(5) (b)?

20 MR. MORRIS: That was a piece of it.

21 MS. SCHNITZLER: That was a portion of it.

22 MR. MORRIS: That was one small piece of
23 it.

24 VICE CHAIRMAN BONACA: Please refer to
25 that at some point to get a picture because we have

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1 seen some in the back.

2 MR. MORRIS: B(5)(b) is shorthand for
3 section B(5)(b) of that order.

4 VICE CHAIRMAN BONACA: Okay.

5 MEMBER MAYNARD: There were many other
6 things in that order.

7 MR. MORRIS: Yes.

8 MS. SCHNITZLER: And because it was
9 safeguarded and classified, they named it the
10 numerical name that it had.

11 MEMBER MAYNARD: It's the one that caused
12 more interaction between the --

13 MR. MORRIS: Well, it's a fairly ambiguous
14 requirement in the order. So that led to lots of
15 discussion about what was really intended and what was
16 required to actually satisfy their requirement.

17 MS. SCHNITZLER: The next issue was over
18 time for security personnel. And that placed
19 scheduling limits on the number of hours officers
20 could work in a workweek or in an ongoing period to
21 try to make sure that there is some oversight.

22 The order for training and qualifications
23 delineated additional annual training for security
24 officers. And the access authorization order
25 incorporated additional background screening

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1 requirements for personnel working at nuclear power
2 plants.

3 Lastly, the DBT, which we have discussed,
4 was modified to more closely meet the increased
5 terrorist threat. So that is kind of the big picture.

6 In addition to the orders, there were
7 other actions that were taken. They include issuing
8 security advisories, guidance on security topics, and
9 conducting force-on-force evaluations, to determine
10 successful incorporation of the revised DBT and new
11 security requirements.

12 The NRC also reached out to other agencies
13 to increase --

14 MEMBER MAYNARD: Okay. Force-on-force had
15 been going on for some time.

16 MS. SCHNITZLER: Yes, sir.

17 MEMBER MAYNARD: The character of that
18 case, and the core incorporated. But that was not a
19 new --

20 MS. SCHNITZLER: It was not new.

21 MR. MORRIS: We had operational -- they
22 were called OSREs, operational security readiness
23 exercises. And we did those. Not every plant got
24 one. We only did them every eight years at plants.
25 And that program was terminated prior to 9/11 because

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1 there was another effort going on that basically
2 pushed that all off on the licensees themselves, make
3 it a self-assessment.

4 But then after 9/11, that program got
5 resurrected and made much more sophisticated and
6 robust. And it happens at every facility now every
7 three years. And, in fact, the first three-year cycle
8 ends this December. And so by the end of this year,
9 this calendar year, we will have completed every power
10 reactor site in the country at least once.

11 MS. SCHNITZLER: In addition, the NRC also
12 reached out to other agencies to increase the flow of
13 information and assistance. That included DHS,
14 Department of Homeland Security; NORAD; and FAA.

15 MEMBER CORRADINI: Just again, if this
16 delays you, you tell us.

17 MS. SCHNITZLER: That's all right.

18 MEMBER CORRADINI: Where is the dividing
19 line between NRC's responsibilities and authority and
20 DHS'?

21 MR. MORRIS: I'll take that.

22 MS. SCHNITZLER: Thank you.

23 MEMBER CORRADINI: Because being at a
24 university, I am very confused.

25 MR. MORRIS: Yes, I know it's very --

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1 MEMBER CORRADINI: Since we have to deal
2 with chemical agents, biological agents, as well as --

3 MR. MORRIS: No. It's a terrific
4 question. I mean, we get it all the time anyway. So
5 it's appropriate. The NRC's regulatory authority ends
6 with the design basis threat.

7 So to the extent that the domestic threat
8 is this big, the design basis threat is some subset of
9 the overall domestic threat present in this country.

10 And the Commission ultimately determines
11 what part of that overall threat is reasonable for a
12 private enterprise to be able to defend against with
13 high assurance. That is the design basis threat.
14 Everything else, any threat characteristic that
15 exceeds that, is now in the purview, belongs to the
16 government, belongs to the United States as a "enemy
17 in a state" or whatever.

18 And that is where DHS and FBI and all the
19 other law enforcement agencies are brought to bear.
20 And so the challenge since 9/11 subsequent to the DHS,
21 the Department of Homeland Security, being formed is
22 to figure out how they are going to do that. How do
23 you deal with the gap that exists between what the
24 site is supposed to be dealing with and what the real
25 threat is?

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1 And so we have expended an enormous amount
2 of energy and continue to to interact with our federal
3 partners. And I have listed off a bunch of them:
4 DHS, FBI, DOD, particularly NORAD when we start
5 talking about -- and FAA when we start talking about
6 aircraft.

7 So that whole integrated response is the
8 focus of one entire branch within our division. And
9 we can go into a lot more detail about that.

10 MEMBER MAYNARD: If you haven't
11 coordinated with other agencies, you need to because
12 there can be confusion as to who is really in charge
13 of what part if something does go beyond the design
14 basis.

15 MR. MORRIS: The short answer to the
16 question is a document entitled the "National
17 Infrastructure Protection Plan," which was published
18 by DHS. And that National Infrastructure Protection
19 Plan is sort of the over-arching document with a
20 variety of signatories to it -- and we are one of them
21 -- signed by Nils Diaz right before he left. We are
22 a signatory to that plan.

23 And then there are 17 subsector-specific
24 plans that have a lot more detail about the how to.
25 And the nuclear sector is one of them. And that is

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1 where we appear.

2 MEMBER APOSTOLAKIS: So for threats
3 smaller than the design basis threat, the other
4 agencies don't get involved or --

5 MR. MORRIS: They get notified through the
6 National Response Plan and a variety of other means,
7 but it is fundamentally the responsibility of the
8 licensee to deal with that.

9 MEMBER CORRADINI: If it falls within the
10 scope?

11 MS. SCHNITZLER: Yes. And the licensee
12 can many times call for assistance and has assistance
13 pre-designated with local law enforcement and other
14 groups as applicable.

15 MR. MORRIS: That's correct.

16 MEMBER MAYNARD: If there's any security
17 issue -- and I guarantee you that all of the agencies
18 will be notified to some degree.

19 MR. MORRIS: That's right. And part of
20 the rulemaking --

21 MEMBER MAYNARD: It's a matter of who is
22 in charge at --

23 MEMBER APOSTOLAKIS: Well, who's in
24 charge and whether there are any plans.

25 MR. MORRIS: That's all defined in those,

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1 what called the NIPP, the National Infrastructure
2 Protection Plan, and the Nuclear Sector-specific Plan.
3 We are addressing some of those issues in our
4 rulemaking that we are doing, specifically with
5 reportability and integrator response.

6 There's a lot of things that touch on
7 that, but I could spend the whole hour just talking
8 about how we do that and are trying to accommodate
9 that more efficiently and effectively.

10 MS. SCHNITZLER: All of these things that
11 we have been doing since 9/11 have garnered an
12 abundance of information, lessons learned, information
13 we learned through inspection of the orders,
14 evaluations of force-on-force, and through the
15 security frequently-asked-questions process.

16 Then, in addition to this pile of
17 information we had --

18 MEMBER WALLIS: I'm sorry. So when you
19 learn lessons, you learn lessons from Iraq?

20 MR. MORRIS: Those types of issues are
21 generally -- the short answer is yes? That's the
22 short answer. There are a lot of ways that that
23 happens that I won't get into here but yes.

24 MEMBER WALLIS: So all kinds of
25 force-on-force --

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1 MR. MORRIS: Absolutely. Absolutely.

2 MS. SCHNITZLER: Yes.

3 MR. MORRIS: Yes, both in terms of the
4 threat, how you detect the threat, and how you
5 mitigate the threat. I mean, all of those lessons --

6 MEMBER WALLIS: And what you need to do to
7 respond.

8 MR. MORRIS: Yes, absolutely.

9 MS. SCHNITZLER: So in the midst of this,
10 in August of 2005 came the EPA Act signed by President
11 Bush on 8/05. A portion of this act focused on
12 security. And there were several security issues for
13 NRC consideration.

14 There were specific provisions for the NRC
15 and DHS to interface on the siting of new security
16 plants. That provision resulted in an MOU between the
17 NRC and DHS delineating consultation between the
18 agencies concerning potential vulnerabilities of the
19 location of proposed new facilities to terrorist
20 attack.

21 So that is one piece of the act that is
22 already in place and that we're working.

23 MEMBER CORRADINI: So if I could just, if
24 I am allowed to understand, so these provisions are
25 different than the way in which you interfaced with

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1 the current plants?

2 MS. SCHNITZLER: No.

3 MR. MORRIS: The issue that she spoke to
4 on the MOU, the memorandum of understanding, the
5 Energy Policy Act introduced a new requirement in our
6 licensing process, which basically mandates that we
7 "consult" with the Department on Homeland Security as
8 we review new reactor application but specifically
9 just the siting, not the facility itself. It's the --

10 MS. SCHNITZLER: Where are you going to
11 put it?

12 MEMBER CORRADINI: Got it, yes. Okay.

13 MR. MORRIS: So that MOU is --

14 MEMBER APOSTOLAKIS: That includes
15 existing sites?

16 MR. MORRIS: Indeed, yes, which is
17 interesting, but what are you going to do at that
18 point?

19 MEMBER ARMIJO: Does DHS have an approval
20 or disapproval authority in --

21 MR. MORRIS: They have a consultation
22 role, the details of which are being ironed out. The
23 devil is in the details. We have a three-page MOU
24 that is very high-level.

25 What DHS is actually going to do when we

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1 hand them an application, saying, "Give us your
2 opinion," frankly, remains to be seen. And we are --

3 MEMBER WALLIS: Who is responsible for
4 doing the job right?

5 MR. MORRIS: We are the responsible for
6 the licensing. If they --

7 MEMBER WALLIS: With consultation.

8 MR. MORRIS: With consultation with DHS.

9 MEMBER ARMIJO: The worst thing is to have
10 two people in charge.

11 MR. MORRIS: The MOU makes that fairly
12 clear.

13 MEMBER ARMIJO: Is the DBT
14 site-independent?

15 MR. MORRIS: Absolutely. It only depends
16 on if I am going to build a category 1 fuel cycle
17 facility, I have to use this DBT. If I am going to
18 build a power reactor, I have to use this one. It
19 doesn't matter where it is.

20 MEMBER ARMIJO: Does it depend on whether
21 it is on the coast --

22 MR. MORRIS: No.

23 MEMBER ARMIJO: -- or inland?

24 MR. MORRIS: No.

25 MEMBER CORRADINI: But I thought he was

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1 about to ask, then, how does that fit in with the new
2 provision, which makes you consult with them about the
3 site if the DBT is site-independent?

4 MR. MORRIS: I guess I don't understand
5 the question.

6 MS. SCHNITZLER: They are side by side.

7 MEMBER CORRADINI: But, I mean --

8 MS. SCHNITZLER: The DBT is a separate --

9 MEMBER CORRADINI: Right.

10 MS. SCHNITZLER: You know, you need to
11 build your facility and your programs to match the
12 DBT.

13 MR. MORRIS: Right.

14 MS. SCHNITZLER: Where you build your
15 site, that is where you get into the consultation with
16 DHS, you know, to give you some information about
17 whether the place that you build it is a good place or
18 has more risk or not.

19 MR. MORRIS: Right. Let me try it this
20 way.

21 MEMBER CORRADINI: Okay.

22 MR. MORRIS: The only requirement, for
23 example, when it comes to siting a power reactor that
24 affects security is in Part 100. And I think it's
25 100.20(f) if anybody cares. But there is kind of a

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1 high-level statement in there that the site has to be
2 such that an adequate security plan can be developed.

3 MEMBER CORRADINI: Okay.

4 MR. MORRIS: That's it. So the question
5 is, what does that mean? And so we have to establish
6 our own guidance as to what that means. Now the
7 question is, well, what additional information or
8 consultation can DHS provide to make that a better
9 product?

10 MEMBER CORRADINI: Thank you.

11 MEMBER MAYNARD: For the existing plants,
12 though, you may have different security. It may
13 require different security response depending on your
14 site. Maybe it would be the same DBT, but depending
15 on where your site is and the site characteristics,
16 one security plan doesn't fit all.

17 MEMBER CORRADINI: Oh, absolutely not.
18 They are all different. Every single one is
19 different.

20 MS. SCHNITZLER: You're right. The
21 physical footprint of your plant, in addition to what
22 you have immediately around you, will impact your
23 program.

24 MR. MORRIS: There's no two security plans
25 in this country that are -- I shouldn't say "plans."

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1 The protective strategies are different everywhere
2 within --

3 MS. SCHNITZLER: And specific to the site.

4 MR. MORRIS: Right, absolutely.

5 MS. SCHNITZLER: Okay? So the Energy
6 Policy Act also said, you know, we need to consider
7 some other things. It said you should consider the
8 events of 9/11; that you should assess a range of
9 threats and multiple methods of implementation, you
10 know not box the threat in quite so much; ensure sites
11 adequately planned for protection of public health and
12 safety.

13 MEMBER WALLIS: That's quite different
14 from force-on-force. I mean, the operators have to
15 know what to do. A lot of people have to know what to
16 do in the event of an attack, not just a security
17 matter. It's a safety matter.

18 MR. MORRIS: Absolutely.

19 MS. SCHNITZLER: Right. And that's an
20 excellent segue into how we are making some of those
21 pieces match up.

22 And then the sites should consider the
23 potential for fires of long duration, which you have
24 heard, and then to expand the weapons capability of
25 licensees and go forward with that.

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1 MR. MORRIS: Just quickly to address the
2 point that you made, you are absolutely right. The
3 emergency preparedness folks are actively engaged in
4 a lot of this. In fact, we are modifying our -- we
5 are looking at some modifications to our exercise
6 program, to include security elements and how the
7 operators in those response organizations would deal
8 with those sorts of events.

9 We are also looking at imminent attack
10 procedures whereby the operators would become alerted
11 to something and how they interact with the
12 surrounding community, et cetera.

13 So there are a lot of other things that
14 are happening that we are not specifically addressing
15 in this presentation.

16 MS. SCHNITZLER: Right, but we are at this
17 point proceeding towards rulemaking that had many
18 objectives that we needed to accomplish and roll in.

19 VICE CHAIRMAN BONACA: Let me ask you
20 about that, though. The previous slides were headed
21 by "Energy Policy Act."

22 MS. SCHNITZLER: Right.

23 VICE CHAIRMAN BONACA: Now you are moving
24 into security rulemaking, --

25 MS. SCHNITZLER: Right.

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1 VICE CHAIRMAN BONACA: -- which is going
2 to be --

3 MS. SCHNITZLER: -- which the items from
4 the Energy Policy Act plus the other things we learned
5 from implementation of our orders were put into
6 objectives that we wanted to achieve --

7 MR. MORRIS: Through rulemaking.

8 MS. SCHNITZLER: -- through rulemaking.

9 VICE CHAIRMAN BONACA: Okay. So you have
10 a rulemaking underway.

11 MS. SCHNITZLER: Yes.

12 MR. MORRIS: Yes. We have actually
13 completed the design basis threat rulemaking. That
14 was published as a final rule in April of this year.
15 And then we have got a much more significant in my
16 view rulemaking underway, which basically revises the
17 entire set of power reactor security requirements,
18 73.55, and amends all the access authorization
19 requirements in 73.56. And it takes on three of the
20 appendices to Part 73 dealing with contingency
21 response, training, qualification, reporting.

22 And then it further adds a new requirement
23 that was granted to us under the Energy Policy Act
24 that Bonnie didn't mention, which enables the NRC to
25 preempt the authority of state law and enable the

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1 licensing of automatic weapons at facilities, which we
2 have never previously been able to do.

3 VICE CHAIRMAN BONACA: Okay.

4 MS. SCHNITZLER: Okay. So we have a whole
5 laundry list of things we want to include in our
6 rulemaking. Now, we will make the orders that we have
7 issued already generically applicable; incorporate the
8 items from the EPA Act; add requirements based on the
9 insights of prior actions; address security for MO_x
10 fuel; and review and revise notification to the NRC
11 for security events, and then address petition for
12 rulemaking, PRM 50-80, requesting regulation that
13 would ensure security/safety interface remains intact;
14 and another petition for rulemaking requesting
15 officers be placed at entrances to nuclear plants.

16 MEMBER APOSTOLAKIS: I guess I don't quite
17 understand what it means to ensure a security/safety
18 interface.

19 MR. MORRIS: Yes. Let me take it out of
20 the abstract and give you a real-life example. We saw
21 through the implementation of the requirements that we
22 issued by orders cases where the security organization
23 would erect some barrier or construct some thing to
24 enhance security, but it actually had an adverse
25 effect on safety.

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1 And, again, to take that out of the
2 abstract, fire hydrants that were placed around the
3 facility, you know, fencing or barriers would be
4 placed so now if there was a fire, the four firemen
5 couldn't get to the hydrant anymore. That's the type
6 of thing we're trying to deal with.

7 And so we actually approved that petition
8 because it's a good idea. And so, of course, you
9 know, how you build the specific guidance to deal with
10 that is part of the ongoing discussion.

11 And we have seen it the other way, too,
12 where security isn't notified of some operational
13 thing that is going on and that would necessarily
14 affect the protective strategy at that facility. That
15 didn't know. So, in other words, we're trying to make
16 the right hand talk to the left hand through this
17 rule.

18 MEMBER POWERS: I will comment that we had
19 a very similar situation at Rocky Flats, where the
20 security organization change shut the exit doors for
21 responding to a criticality of our --

22 MR. MORRIS: It's a problem. It's a
23 problem. And so we're trying to get them to sit down
24 across the table from each other and talk to each
25 other about what they are doing.

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1 MEMBER POWERS: Can I ask how you see the
2 security of MO_x fuel being different from low
3 enrichment uranium fuel?

4 MR. MORRIS: Yes. Well, mixed oxide, in
5 fact, we have actually completed a licensing action
6 you may or may not be aware of at Catawba, in which
7 they are actually burning MO_x fuel.

8 And so we actually altered some of the
9 security requirements that were applicable at that
10 site when the fuel was on site but not in the reactor
11 or I guess it was in the fuel pit because it's
12 category 1. And category 1 requires a different DBT
13 if you look at our regulations.

14 So during that period of time when the
15 fuel was delivered on site but before it got put in
16 the new fuel pit or in the reactor, there are some
17 extra security provisions that deal with that.

18 MEMBER POWERS: So your concern is with
19 the isotopic fraction in the fuel?

20 MR. MORRIS: Right.

21 MEMBER POWERS: So would that same concern
22 exist if we made MO_x out of a reactor-grade plutonium?

23 MR. MORRIS: Yes, absolutely.

24 MEMBER POWERS: It would exist?

25 MR. MORRIS: I believe so. Category 1 is

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1 --

2 MEMBER POWERS: Yes, it's Category 1.

3 MR. MORRIS: Yes.

4 MEMBER POWERS: Yes.

5 MEMBER ARMIJO: Regardless of the isotopic
6 composition?

7 MR. MORRIS: Right. If it meets the
8 Category 1, that's the way we have been dealing with
9 it. You know, of course, you get into arguments
10 about, yes, but it is too hard to reprocess. And we
11 have had all of those arguments, but --

12 MEMBER POWERS: It's easy to reprocess.
13 It's hard to make it detonate --

14 MR. MORRIS: Well, yes.

15 MEMBER POWERS: -- but not impossible.

16 MR. MORRIS: But then it comes into
17 reasonableness and what does high assurance mean. You
18 know, one thing you may or may not appreciate, in
19 safety space, the regulatory standard is reasonable
20 assurance, but in security space, the regulatory
21 standard is high assurance. But it is still
22 subjective. I mean, what does high assurance really
23 mean?

24 And so those are the issues that we
25 struggle with in licensing.

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1 MS. SCHNITZLER: So here we were, all of
2 this data, all of this information, and rulemaking on
3 the horizon. And how did we split it up and start
4 working on it?

5 The first rule that we worked on was 73.1,
6 design basis threat. We modified the performance
7 requirements that security programs are based on. It
8 includes or addresses many provisions of the EAct,
9 including some of the key changes that are listed
10 here.

11 It was published in March of this year and
12 supplemented with two regulatory guides.

13 MR. MORRIS: The biggest change was the
14 addition of the cyber attack, which we never had
15 explicitly enumerated in the threat characteristics.

16 MEMBER APOSTOLAKIS: Did we cite attacks
17 before?

18 MR. MORRIS: Yes.

19 MS. SCHNITZLER: The next one is Part 73,
20 "Power Reactor Rulemaking." This basically touches
21 all the regulations regarding security at power
22 reactors. 73.55 is pretty much the heart of this
23 project and deals with basic requirements and
24 day-to-day security.

25 Included in the revision of 73.55 are

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1 requirements for cyber security. And that applies to
2 many computer systems in the plant, not just security
3 computers.

4 MR. MORRIS: That is an important point --

5 MS. SCHNITZLER: Right.

6 MR. MORRIS: -- I just want to spend 20
7 seconds on. Not only did we change the design basis
8 threat rule to include a threat from the cyber realm,
9 but we have also added a fairly significant section in
10 the physical security requirements, the section of
11 Part 73 that deals with "Okay. Now that we recognize
12 that the threat is there, what programs, processes, et
13 cetera, do you need in place to deal with that?"

14 And so what Bonnie is saying here is that
15 the systems that are within the scope of those
16 requirements are not just security systems. They are
17 safety systems, security system, and any system that
18 is needed for emergency response.

19 MEMBER CORRADINI: So I have a generic
20 question that I guess we are not supposed to know
21 about, but it is just curiosity. So on all of these
22 things, are these risk-based? How do you determine
23 which one do you do and which one do you don't do?
24 Based on a risk calculation?

25 MR. MORRIS: It's an interesting question.

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1 The design basis threat is nothing --

2 MEMBER CORRADINI: In our land were
3 risk-informed.

4 MS. SCHNITZLER: Right.

5 MR. MORRIS: Sure. The design basis
6 threat itself is risk-informed. It is actually not
7 risk-informed. It is threat-informed. But it is
8 nothing more than a set of adversary characteristics.
9 It doesn't tell you how to deal with it. It just
10 says, "Deal with it."

11 Then you go to these things that are on
12 page 11. And this is more of the how you deal with
13 it. You have to have vehicle barriers. You have to
14 have intruder detection systems. You have to have a
15 central alarm station. You have to have a secondary
16 alarm station. You have to have access authorization
17 requirements.

18 MEMBER CORRADINI: But in terms of
19 quality, this is more like the way safety was done 30,
20 40 years, where there is a laundry list of stuff that
21 there is the thing you worry about and there is a
22 laundry list of stuff to make sure you worry about it
23 but there is no risk calculation if this stuff is
24 better than that stuff, better than --

25 MR. MORRIS: That's true. That's true.

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1 MEMBER CORRADINI: Okay.

2 MR. MORRIS: Now, that being said, we have
3 done a lot to try to make this a performance-based
4 rule so that we allow a fairly wide open means for
5 licensees to implement these.

6 MS. SCHNITZLER: Right, right.

7 MR. MORRIS: We say you have to have a
8 vehicle barrier system, but we don't say it has to be
9 made of concrete or it has to be made of steel or that
10 it has to be painted red. I mean, it is a
11 performance-based requirement.

12 MR. WHITE: How do you do it for
13 performance-based cyber? Do you just do it on the
14 basis of prevention? Do you just prevent access to
15 outside world into your -- do you have mitigation and
16 response and all of that kind of stuff?

17 MR. MORRIS: I would love to have that
18 conversation with you. That is an excellent question
19 because we have this requirement, and we have been
20 working very closely with the industry. And they have
21 stood up a cyber security task force.

22 We have worked with national labs to
23 generate two new regs that deal with that issue. They
24 have adopted, the industry has adopted, those NUREGs
25 and built an entire cyber security program management

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1 guideline around those that uses risk insights, that
2 uses -- it's a very systematic self-assessment of all
3 of the digital assets on your site prioritized by risk
4 and other metrics. And then you build your protective
5 strategy based on that information.

6 It's a long conversation, but it's
7 pertinent because it's an ongoing dialogue that we're
8 having right now. And it's not easy. It's not an
9 easy issue. And this is huge for new reactors because
10 all of these brand newfangled digital systems are
11 being --

12 MEMBER MAYNARD: Yes. For the existing
13 plants, this is one of the times when you're glad that
14 you're making high in the technology.

15 MR. MORRIS: Yes. I'm almost too
16 embarrassed to admit that, but it's true.

17 MS. SCHNITZLER: Okay. Appendix B on this
18 list revises and updates the training and
19 qualifications of security officers. And I want to
20 point out appendix C, which details the requirements
21 for security contingency plans.

22 In addition to security actions during
23 security events, the contingency plan includes
24 requirements for an integrated response plan, which
25 details the procedures and plans and strategies to

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1 maintain or restore core cooling capabilities,
2 containment, and spent fuel pool cooling capabilities,
3 using existing or readily available resources that can
4 be implemented with loss of large areas of the plant
5 due to explosion or fire, kind of a bit mouth but --

6 MR. MORRIS: That's B(5)(b). That's what
7 that is.

8 MS. SCHNITZLER: And that's basically
9 B(5)(b).

10 MR. MORRIS: Now, it is worth pointing out
11 here that most of that stuff, 95 percent of that, if
12 not more, is operational. It's what do the operators
13 do, what do the first responders, not security. The
14 event already happened. Now it's what do you do about
15 it to keep the core cool and shutdown and all of that.

16 So we are actually considering internally
17 extracting that requirement from the security
18 regulations and moving it to a more appropriate in my
19 view location in Part 50, but that's an ongoing
20 internal discussion.

21 MS. SCHNITZLER: But I wanted to make sure
22 you knew that that was in that part.

23 VICE CHAIRMAN BONACA: Appreciate it
24 because --

25 MS. SCHNITZLER: Right.

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1 VICE CHAIRMAN BONACA: -- in the line,
2 that is what it is.

3 MS. SCHNITZLER: 73.56 generically applies
4 to the access authorization order, updates the rule
5 language, and complements the changes in 55.

6 73.71 enhances the reporting requirements
7 to the NRC for security issues.

8 And then the last two are two new ones.
9 73.18 and .19 are new regulations on the use of
10 enhanced weapons, as Scott discussed. It expands the
11 weapons capability for licensees in protection of
12 their facilities.

13 It's currently proposed to be applicable
14 to nuclear plants and to category 1 facilities and is
15 part of the EPAct. The last part is 73.58, which we
16 have discussed a little bit, too, new regulation that
17 assures the security/safety interface at nuclear
18 plants.

19 Next is in new reactors. We also
20 initiated a rulemaking to require consideration of
21 security requirements in the design stage for new
22 reactors. This was proposed to the Commission as
23 73.62, "Security Assessment Requirements for Nuclear
24 Power Reactor Designs" in September of '06.

25 In April of this year, the Commission

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1 disapproved the proposed rule and directed the staff
2 to place some aspects of that into a rulemaking for
3 Part 52. They also requested that guidance for the
4 new reactors proceed, and that is being done.

5 MEMBER APOSTOLAKIS: Did they say why?

6 MR. MORRIS: Yes. I can give a little
7 more background on that. Basically what occurred is
8 that as early as 2003-2004, the staff was writing
9 papers to the Commission about, gee, it looks like new
10 reactors might come back. And we said, "Well, gee,
11 wouldn't it make sense to update the advanced reactor
12 policy statement to include an expectation that
13 securities measures be considered at the design
14 stage?"

15 Because, I mean, right now the way you can
16 look at security is it is an add-on. You build a
17 reactor. You make sure it is safe, et cetera. And
18 then you put a layer of guys with guns around it.

19 What we are saying is, why don't you make
20 the thing hard to begin with? And then you don't need
21 as many guys with guns. You make the things
22 inherently more robust for security purposes.

23 VICE CHAIRMAN BONACA: You know, we
24 supported that.

25 MR. MORRIS: The Commission agreed with

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1 that. We wrote a paper. And they said, "Agree with
2 that. Go ahead. Update the policy statement to
3 include that thought. And, oh, by the way, generate
4 a proposed rule."

5 So we did that, which we delivered in '06.
6 And then, for a variety of reasons, it got
7 disapproved; in part, because the Commission felt that
8 some of the things that were being proposed in here
9 would already be addressed by new reactor applicants
10 because of all of the work that we had done in the DBT
11 rule and these other rulemakings that we are talking
12 about.

13 But one part that clearly fell outside of
14 that was airplanes. And so they said, "Okay. You're
15 right. We need to keep that piece." But they said,
16 "Rather than make that a 73 rule, let's make that a
17 Part 52 rule because we are really focused on new
18 reactors. We want those new reactors to explicitly
19 consider aircraft impact in their designs."

20 And so that is what happened.

21 MEMBER APOSTOLAKIS: And this is now
22 proceeding? Is that the one --

23 MR. MORRIS: That is ongoing. That is
24 actually a rulemaking being conducted by the Office of
25 New Reactors and --

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1 MEMBER WALLIS: All of these are external
2 threats. How about the sophisticated insider who is
3 cyber-knowledgeable? That is the kind of thing that
4 might be more --

5 MR. MORRIS: Yes. We can have that
6 discussion, I mean, but the design basis threat
7 includes an insider.

8 MEMBER WALLIS: You can design the place
9 so it is less easy for some guy to screw it up from
10 inside, I would hope.

11 MR. MORRIS: An insider is a bad thing,
12 absolutely, particularly an active insider. And so
13 one of the ways that the agency has dealt with that --
14 first of all, it is an element of a design basis
15 threat. So licensees have to have the means to deal
16 with it.

17 MS. SCHNITZLER: And there are multiple
18 programs and layers --

19 MR. MORRIS: Right.

20 MS. SCHNITZLER: -- that try to prevent
21 that from occurring.

22 MEMBER WALLIS: Recognizing it is
23 happening.

24 MS. SCHNITZLER: Right.

25 MR. MORRIS: Yes. That's very much an

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1 active dialogue. And it's actually very much a piece
2 of the proposed rulemaking we are doing. There is an
3 insider mitigation program at all of these facilities,
4 the elements of which include additional physical
5 measures but also additional behavioral observation
6 requirements, access authorization.

7 There are a variety of things that are
8 done to try to -- but it is still a real concern. And
9 we are trying to deal with that in the cyber security
10 part of the rulemaking and guidance as well. But,
11 again, we're --

12 MEMBER MAYNARD: I do think that is an
13 important aspect that needs to be dealt with. I think
14 at some point, though, we have to say, "When are we
15 starting to get diminishing returns?" because I don't
16 care what you do, what you put in place, I can always
17 then come up with a new thing to consider.

18 And, you know, at some point we may need
19 to make sure that we are still focusing on operating
20 the power plant and taking care of what's --

21 MR. MORRIS: I have heard that argument
22 many times, many times. And I don't disagree with it.
23 So the question is, what is enough to demonstrate high
24 assurance?

25 MEMBER MAYNARD: So I guess that gets back

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1 to --

2 VICE CHAIRMAN BONACA: That is a long time
3 for requirements. I mean, we are talking about 20-25
4 years requirements that you cannot disable the plant
5 to bring it from one location. There is no individual
6 location from which an individual can disable the
7 plant. And there is a possibility that an individual
8 by himself can do that.

9 MR. MORRIS: And particularly when it
10 comes to cyber, a lot of the redundancy and diversity
11 requirements that are the general design criteria in
12 part 50 actually help further that goal. But in the
13 digital world, I mean, I also serve on the Digital I&C
14 Steering Committee, which -- I don't know if you -- if
15 we haven't met with you, we are going to soon.

16 In fact, we have a Commission meeting next
17 week, where this is one of the topics that we are
18 trying to iron out because some of these vendors are
19 putting everything into one box. You can't trace
20 wires. It's not analog. It's not relays. It's
21 software.

22 MS. SCHNITZLER: Right. As you can
23 imagine, all of this rulemaking, you know, promulgated
24 a prolific amount of regulatory guidance. And so this
25 is a list of the regulatory guidance under development

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1 that will be published at the end of this year in
2 draft form. And it goes with the power reactor
3 rulemaking.

4 MEMBER APOSTOLAKIS: Mario, are we
5 reviewing those?

6 VICE CHAIRMAN BONACA: We are going to
7 talk to the ones that we --

8 MR. MORRIS: There's a few of them that we
9 are going to ask you to take a look at.

10 MS. SCHNITZLER: And the special note --

11 MR. MORRIS: You can always defer. You
12 can always decline.

13 MEMBER APOSTOLAKIS: I know.

14 MS. SCHNITZLER: Yes.

15 MEMBER APOSTOLAKIS: But our Chairman here
16 doesn't let us do it.

17 VICE CHAIRMAN BONACA: One we are already
18 involved in is guidance for the --

19 MS. SCHNITZLER: Right. And there's a
20 couple of them on here. You know, one is the
21 contingency planning guidance.

22 MEMBER APOSTOLAKIS: I would like to see
23 that one.

24 MS. SCHNITZLER: That would be one, the
25 portion of it that has to do with large area fires,

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1 the guidance for cyber security addressing the
2 requirements of 73.55(m). Those are two here that
3 need your review and the guide for safety/security
4 interface.

5 MR. MORRIS: Which was just published or
6 is about to be published in draft form?

7 MS. SCHNITZLER: It is just about to be
8 published.

9 MEMBER ARMIJO: Some of these guides; for
10 example, the weapons, will that be open to the public?

11 MS. SCHNITZLER: Yes. We are really
12 focusing as much as we can on making our guidance
13 publicly available. The first two guides that are
14 published in July are the safety/security interface
15 and guidance on reportability. They are publicly
16 available. And we are very closely looking at the
17 other guidance to make sure we have interaction to the
18 fullest extent that we can.

19 MR. MORRIS: Physical security probably
20 won't be. A couple of these probably won't be.

21 MEMBER ARMIJO: This is the kind of
22 information useful to somebody.

23 MS. SCHNITZLER: Right.

24 MR. MORRIS: Exactly.

25 MEMBER ARMIJO: I mean, why --

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1 MR. MORRIS: Obviously if it is
2 safeguards, it is not going to be out there. And
3 there are other things that we look at. But we have
4 also received an SRM from the Commission when they
5 have approved this proposed rule to not only produce
6 reg guides that are safeguards but also produce
7 publicly available reg guides.

8 So I don't know whether that -- to date,
9 I don't know whether that means I as supposed to
10 redact them all and issue redacted versions or what.
11 And so that is part of my struggle, but it is not my
12 immediate struggle. I've got plenty of those. That
13 is not one of them.

14 The point is the Commission is sensitive
15 to the idea that we have hidden behind the curtain for
16 a long time and appropriately so. But to the extent
17 we can begin to engage and share in an open forum,
18 particularly since this is rulemaking, you know, we
19 need to do that.

20 MEMBER APOSTOLAKIS: Are the rules public?

21 MR. MORRIS: Absolutely, --

22 MS. SCHNITZLER: Yes.

23 MR. MORRIS: -- although the industry
24 argued very hard to not make them public.

25 MEMBER ARMIJO: What was their logic?

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1 MR. MORRIS: Well, their logic is the
2 industry -- I mean, I don't want to put words in their
3 mouth, but a paraphrase of it is the idea was they're
4 looking for you probably heard regulatory stability.
5 You've probably heard that before.

6 And security is an area where they feel
7 quite vulnerable with respect to regulatory stability
8 because threats change and technologies change and a
9 lot of things are going on in the world.

10 So in order to have achieved the maximum
11 degree of regulatory stability, they offered that the
12 NRC should avail itself of the provisions in the
13 Atomic Energy Act to conduct secret rulemakings, which
14 would mean we would have to devise a whole
15 out-of-the-public-eye rulemaking process, which we
16 currently don't have but we are able to have by the
17 statute but then to build that process and then codify
18 all of these security requirements in rules because if
19 we did that, it's a lot harder for the staff to change
20 it.

21 MS. SCHNITZLER: It's written at a more
22 specific level.

23 MR. MORRIS: Right. I mean, what Bonnie
24 didn't tell you was, but maybe it was implicit, is
25 that there is a fair amount of ambiguity in some of

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1 these regulations. Why? Exactly for the very thing
2 that you just said, because if you say you have to
3 have this, you have to have that, and it has to be
4 this color and this thickness, you are just basically
5 giving the bad guy a road map to how to beat you.

6 So there is a fair amount of ambiguity in
7 the rule. The details are captured in the orders that
8 we issued and in these safeguards reg guides. Well,
9 --

10 MS. SCHNITZLER: There is it.

11 MR. MORRIS: The industry argues if the
12 guides are where the real requirements are, well, you
13 guys can change those. I mean, that doesn't require
14 any -- but if it's in a rule, that's a lot harder for
15 you to change those. That's true.

16 MEMBER MAYNARD: Yes. But, really, is
17 that such a bad thing? I mean, again, you need to
18 have some flexibility to be able to do some things.

19 MS. SCHNITZLER: I think so, too.

20 MEMBER MAYNARD: But also if you make it
21 too flexible, you really are moving things around. It
22 needs to be before changes are made that there is more
23 consideration given than just "Gosh. You know, I
24 think things are a little different."

25 MR. MORRIS: And you can imagine we have

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1 a lot of spirited discussions with the industry over
2 just this and with our Commission and with other
3 senior management and other federal stakeholders,
4 quite frankly.

5 And I do believe that ultimately we come
6 out in the right place. We don't just willy-nilly
7 issue it.

8 MS. SCHNITZLER: I think we are in a good
9 spot. I think we have enough specificity in the rule
10 to lay out the expectation but to give the site enough
11 flexibility for their physical footprint or for their
12 different budgeting venues to look at alternatives.
13 So I am pretty comfortable we are in a fairly good
14 middle of the road area with --

15 MEMBER MAYNARD: I think we need to
16 maintain that balance.

17 MS. SCHNITZLER: Yes.

18 MEMBER MAYNARD: I don't think we should
19 go either way too far.

20 MS. SCHNITZLER: This is a list of
21 additional regulatory guidance that we are reviewing.
22 I would only point out the last two reg guides. They
23 are --

24 MR. MORRIS: NUREGs.

25 MS. SCHNITZLER: NUREGs. I'm sorry. And

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1 they are guidance in support of new reactors. And I
2 suspect that we may be asking you to review that also.

3 MR. MORRIS: The last one is of particular
4 interest because it is basically a -- it's a menu is
5 what it is. It's things you can do with the design of
6 a new facility that improves its resilience or
7 robustness if that's a word against a threat.

8 MS. SCHNITZLER: It improves the security
9 posture.

10 MR. MORRIS: For example, it shows you all
11 these technologies that are out there and construction
12 techniques, et cetera, that make the facility more
13 robust from a security posture standpoint.

14 MEMBER POWERS: Do you address underground
15 studies?

16 MR. MORRIS: Berms, not necessarily
17 underground.

18 MEMBER POWERS: Why is there resistance to
19 underground citing?

20 MR. MORRIS: I don't know. I don't have
21 the answer to that.

22 MEMBER POWERS: In the late '70s but
23 before TMI, I know that a study was carried out where
24 they were looking with regard to a safety and not a
25 security. And what they looked at at the time was

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1 "Okay. Here is how the plant is built above ground.
2 Put it underground. Don't change anything about the
3 plant, what you can do for underground citing." It
4 came out a wash from safety. You know, it was --

5 MR. MORRIS: So, therefore, nobody wanted
6 to dig a hole.

7 MEMBER POWERS: Nothing went beyond on
8 that. And they certainly didn't look at optimizing
9 how you just built a plant different if you built it
10 underground.

11 But nobody looked at the security at the
12 time. And the fact that it was a wash on safety
13 suggests that they didn't run into any formidable
14 technical difficulties in doing that.

15 MR. MORRIS: That certainly has appeal
16 from a security standpoint. It's certainly hard to
17 hit it with an airplane when it is underground or you
18 limit the number of entry points if you are a bad guy.

19 MEMBER POWERS: Yes, there were two.
20 There were only two entry points to it. And it would
21 be relatively easy to defend both of those entry
22 points because they were both --

23 MR. MORRIS: But I don't know. That's a
24 good question. I don't know.

25 MEMBER POWERS: But the other thing that

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1 comes up is that for the MO_x fuel fabrication
2 facility, we are looking at basically a Butler
3 building outside a fence. But next door to it is the
4 DOE facility, which is the plutonium pit disassembly
5 that is basically a bermed-in heavy wall structure.
6 That makes the difference. It's the same plutonium on
7 both sides of the fence.

8 MR. MORRIS: Yes.

9 MEMBER POWERS: In fact, there is more of
10 it over in the process facility than there is at any
11 one time in the pit disassembly facility.

12 MR. MORRIS: I won't speculate on that.

13 MS. SCHNITZLER: Okay. This next slide is
14 probably the real reason for the meeting and what you
15 would like to focus on. This slide kind of
16 encapsulates all of the things we have discussed and
17 have talked about, places where we think we are going
18 to need ACRS reviews; as we have discussed, digital
19 computer and communication, safety/security interface,
20 the Bravo(5) (bravo), you know, large area fire, and
21 then the NUREGs for new reactors.

22 VICE CHAIRMAN BONACA: Well, this is very
23 useful. And I appreciate your coming and telling us
24 about it because, I mean, I didn't know, for example,
25 digital computer and communication networks were

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1 coming up. It's just an example.

2 MR. MORRIS: Yes. One of the biggest uses
3 that we are trying to reconcile in that arena is the
4 fairly prescriptive requirements in Part 50 for safety
5 system controls and regulatory guidance that has been
6 established. And what we are trying to do in our
7 rulemaking for cyber security is reconcile on those
8 two things.

9 VICE CHAIRMAN BONACA: Okay.

10 MR. MORRIS: That is an issue that we
11 thought that these --

12 VICE CHAIRMAN BONACA: These areas are
13 coming up for our review over the next 12 months.

14 MEMBER APOSTOLAKIS: That's a lot of work,
15 isn't it?

16 MS. SCHNITZLER: Currently our big package
17 rulemaking is due to the EDO on 1/2/08. Our guidance
18 is in development. The draft guidance will be out
19 Summer and Fall of -- it says 2007. Yes. And then
20 ACRS reviews required for portions of that we're
21 estimating to be Fall and Winter of 2007.

22 MR. MORRIS: But that's draft. I mean,
23 those are draft documents.

24 MS. SCHNITZLER: Right.

25 MR. MORRIS: They aren't final documents

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1 but yes.

2 MS. SCHNITZLER: Right.

3 VICE CHAIRMAN BONACA: Okay. Well, that's

4 --

5 MS. SCHNITZLER: And that really concludes
6 our presentation. If you have any other questions or

7 --

8 MR. MORRIS: That's five and a half years
9 worth of work in a nutshell.

10 (Laughter.)

11 MEMBER MAYNARD: I thought it was a very
12 good summary, and I thought it was very useful.

13 MEMBER APOSTOLAKIS: Oh, yes. Very
14 useful, very useful.

15 MEMBER POWERS: Can I just ask a specific
16 question? I see on a lot of the sites these secure
17 firing stations. I think their locations --

18 MR. MORRIS: The ranges? Do you mean the
19 firing ranges?

20 MS. SCHNITZLER: I think he is talking
21 about a BRE, a bullet-resistant enclosure.

22 MR. MORRIS: Oh, bullet-resistant
23 enclosures.

24 MEMBER POWERS: Enclosure. Those of us
25 who --

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1 MS. SCHNITZLER: It looks very similar to
2 --

3 MEMBER POWERS: -- have visiting attacking
4 facilities in the past used to call those targets.

5 MR. MORRIS: It depends on the weapon you
6 are using.

7 MS. SCHNITZLER: Right.

8 MR. MORRIS: They are bullet-resistant
9 enclosures, which implies that the specific -- and I
10 can't go into the detail, but the specific weapon that
11 we attribute to the bad guy in the DBT can't beat
12 that.

13 MEMBER POWERS: Yes, but nobody carries
14 that small of a weapon anymore.

15 MR. MORRIS: Well, that is a discussion
16 you will have to have with people with a lot higher
17 pay grade than me.

18 MS. SCHNITZLER: Right. And don't think
19 that that is the only part of the protective strategy
20 there is.

21 MR. MORRIS: Yes. I mean, that's --

22 MS. SCHNITZLER: That is the other side.

23 MR. MORRIS: When we talked about the fact
24 that the protective strategies at all of the sites
25 were different, that is absolutely true. There are

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1 layers upon layers upon layers upon layers of defense.
2 What you see is just one layer.

3 MS. SCHNITZLER: Just one small piece of
4 it.

5 VICE CHAIRMAN BONACA: I think that it --

6 MEMBER MAYNARD: What you can't see, you
7 have got to be careful about.

8 MS. SCHNITZLER: That's correct.

9 MR. MORRIS: That's right.

10 VICE CHAIRMAN BONACA: Whatever we do I
11 think now falls into place with a picture of that.
12 Thank you very much.

13 MS. SCHNITZLER: Excellent. Thank you.

14 CHAIRMAN SHACK: Well, it is time for a
15 break.

16 (Whereupon, the foregoing matter went off
17 the record at 2:15 p.m. and went back on
18 the record at 2:32 p.m.)

19 5) REVISIONS TO DRAFT FINAL NUREG-1852,
20 "DEMONSTRATING THE FEASIBILITY AND RELIABILITY
21 OF OPERATOR MANUAL ACTIONS IN RESPONSE TO FIRE"

22 CHAIRMAN SHACK: We can come back into
23 session. Our next topic is "Revisions to Draft Final
24 NUREG-1852, 'Demonstrating the Feasibility and
25 Reliability of Operator Manual Actions in Response to

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1 Fire.'" And that, of course, is George.

2 5.1) REMARKS BY THE SUBCOMMITTEE CHAIRMAN

3 MEMBER APOSTOLAKIS: Okay. As the members
4 recall, we reviewed this document last month. And we
5 recommended that it be published after some changes.
6 And the staff has, in fact, made changes to the
7 document we saw.

8 I have already seen the changes. So we
9 will have a briefing by the staff on the changes they
10 made. And then we will send a letter to the
11 Commission or to the EDO, actually, stating whether we
12 agree with what they have done.

13 So, without any further ado, Mr. Ibarra?

14 5.2) BRIEFING BY AND DISCUSSIONS WITH
15 REPRESENTATIVES OF THE NRC STAFF

16 MR. IBARRA: Good afternoon. My name is
17 Jose Ibarra, and I am the Branch Chief of the Human
18 Factors and Reliability Branch in the Office of
19 Nuclear Regulatory Research.

20 We were here last month, like George said,
21 to brief you on the public comments of how we change
22 that NUREG, 1852, "Demonstrating the Feasibility and
23 Reliability of Operator Manual Actions in Response to
24 Fire." And we're here today to address your comments
25 on the NUREG.

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1 This NUREG has been a cooperative effort
2 with the Office of Nuclear Reactor Regulation. And
3 Alex Klein is here representing NRR today. The
4 presentation will be done by Erasmia Lois from my
5 staff.

6 DR. LOIS: Thank you very much.

7 MEMBER APOSTOLAKIS: So what are you
8 bringing there with this black thing, something you
9 don't want us to see? Is it just cosmetic?

10 DR. LOIS: Just cosmetic.

11 MEMBER APOSTOLAKIS: Okay.

12 PARTICIPANT: It's the style, George.
13 It's the style.

14 MEMBER APOSTOLAKIS: That I would lose my
15 --

16 DR. LOIS: So the purpose is to summarize
17 the changes and the request to the ACRS for
18 endorsement to publish the NUREG. And what I am going
19 to do is I am going to briefly summarize the comments
20 and then what we did to address the comments.

21 The first moment was to add to the NUREG
22 a discussion adopting risk assessment and human
23 reliability analysis tools to guide the judgment made
24 when identifying the sources of uncertainties,
25 especially when it comes to the determination of the

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1 time margin.

2 And I believe that the ACRS had in mind
3 these tools and recommended specifically the ATHENA
4 and the EPRI SHARP guidance provides good structure to
5 do the deterministic analysis as well in order to come
6 up before you get up to the numbers, the guidance
7 provided for how do you really explore the various
8 contexts, the human action passages that are performed
9 and what did we take is a very good structured way to
10 solve that in actuality perspective uses could benefit
11 from that guidance for doing a better job in
12 identifying the certainties as well as doing a more
13 efficient job.

14 However, we did not do as much as the ACRS
15 probably wanted. We just added a paragraph where we
16 mentioned that these tools are available and can be
17 used; however, not required. And the only thing that
18 is needed to be done is to determine to show that the
19 visibility and the reliability criteria have met.

20 I believe we did that because we didn't
21 want to add to the confusion as to this or led to the
22 NUREG being perceived as being very encompassing that
23 requires a lot of analysis. It would need for the
24 simplest action to provide tremendous justification.
25 And if we reference ATHENA, the perception of being a

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1 very detailed analysis, then probably we could create
2 more confusion. So we didn't do as much as the ACRS
3 wanted. Sorry about that.

4 MEMBER APOSTOLAKIS: We still haven't
5 written the letter.

6 (Laughter.)

7 MEMBER APOSTOLAKIS: I'm sorry.

8 CHAIRMAN SHACK: You might be sorry.

9 MEMBER APOSTOLAKIS: But I do think that
10 you guys are a little timid. The use of risk-related
11 clinics. What is risk-related about identifying some
12 areas using SHARP or ATHENA? It's not risk. It's
13 just identification of centers. If you want, it is a
14 deterministic analysis, really.

15 The moment you put that risk-related,
16 immediately people say "Oh, this is vampire-related.
17 You know, we shouldn't touch it because this is
18 deterministic."

19 (Laughter.)

20 MEMBER APOSTOLAKIS: Anyway, this is just
21 a comment for the future. At least introduce the
22 concept of scenario, but the scenario construction is
23 really like anything else. We were doing scenario
24 analysis in the deterministic world before. Maybe we
25 didn't call them explicitly scenarios, but we did.

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1 But I suspect there was a concern here of
2 invoking risk-related methods. And, my God, you are
3 not supposed to do that because this is deterministic.

4 I mean, I am not necessarily asking for an
5 answer because I am very certain that this is what
6 happened.

7 CHAIRMAN SHACK: It's a rhetorical
8 comment.

9 MR. KLEIN: This is Alex Klein. If that's
10 a comment, then in terms of a response, I don't know
11 if one is necessary. However, what I do want to say
12 to Dr. Apostolakis is that we acknowledge what your
13 recommendation was in terms of putting the words into
14 the NUREG.

15 We are not necessarily precluding the use
16 of these tools by a licensee. They are free to use
17 other tools that area available, like ATHENA, if they
18 want to, as we have suggested in the wording here that
19 was added to the NUREG.

20 So, you know, bottom line to us is those
21 tools are available. They are free to use those if
22 they wish to inform the application of this NUREG-1852
23 for criteria. And we would not preclude the use of
24 that.

25 MEMBER APOSTOLAKIS: What I am trying to

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1 say, Alex, because I noticed this throughout the
2 meeting last month, when we are reviewing something or
3 preparing something like this NUREG that is supposed
4 to be not risk-informed, immediately there is a wall
5 being raised that surrounds all the risk methods.

6 Anything that is being used in a PRA now
7 is a no-no. And my point is that a lot of the stuff
8 that is being done in the risk area is, in fact,
9 deterministic, in the development of doing scenarios
10 and doing other things. And this wall doesn't make
11 sense.

12 And the idea, the spirit of the comment
13 was to, in fact, help the licensees, not add burden.
14 But that's okay.

15 DR. LOIS: And we recognize that you are
16 absolutely right. And it wouldn't be easily done in
17 this document unless we could add a chapter where we
18 come in and we explain about the PRA tools that do a
19 lot of the deterministic analysis and have developed
20 a structured way to do the deterministic analysis, et
21 cetera, et cetera.

22 That would need at least a chapter that
23 would need to go back and forth to another review, but
24 we take that as a --

25 MEMBER APOSTOLAKIS: In the future, I hope

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1 that we will see some.

2 DR. LOIS: Absolutely. This is a very
3 good point which you are going --

4 MEMBER APOSTOLAKIS: Many times, you know.

5 DR. LOIS: I hope not on this document
6 again.

7 MEMBER APOSTOLAKIS: Many times I have
8 heard in the past. You know, you are making a
9 suggestion, "Oh, but that is risk-informed. You know,
10 we can't use it because this is not risk-informed."
11 The moment you start introducing probabilities, then
12 you become risk-informed.

13 MEMBER WALLIS: That's the wall. Is the
14 wall the probability thing? Is that what creates --

15 MEMBER APOSTOLAKIS: I think, yes, when it
16 comes -- no. The wall is between everything that the
17 PRA, the methods PRA, uses and the so-called
18 deterministic stuff. And my point is that a lot that
19 is being done in the PRA world is, in fact,
20 deterministic in some sense. The moment you introduce
21 the probabilities, then, of course, it becomes
22 different.

23 MEMBER WALLIS: But you have to be sure.
24 You have to say the probability is one or zero. Then
25 you are --

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1 MEMBER APOSTOLAKIS: In this world, that
2 is what you do. If it is three times, then it is
3 okay.

4 CHAIRMAN SHACK: Close enough.

5 MEMBER APOSTOLAKIS: Close enough. Okay.
6 Let's move on.

7 DR. LOIS: Okay. The second
8 recommendation was to add a section that indicates
9 that the level of analysis needed to justify meeting
10 the criteria should be commensurate with the action
11 proposed in a way that if it is a simple action, you
12 may not need as much justification as it would be for
13 a more complicated action.

14 And within that, by adding a paragraph in
15 chapter 1 where we are stating exactly that. A simple
16 action may not need as much justification. For
17 complex actions, licensees may choose to comply with
18 the rule. It doesn't mean they may not have to do
19 extensive analysis, but they do have the option to
20 submit an exemption request. And in those cases, they
21 may need to do more detailed analysis for physical
22 retainability.

23 And then in chapter 3, we --

24 CHAIRMAN SHACK: Excuse me, Erasmia.

25 DR. LOIS: Yes?

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1 CHAIRMAN SHACK: Is this language
2 literally added to the document?

3 DR. LOIS: Yes.

4 MEMBER WALLIS: It doesn't make sense. I
5 don't understand the last language sentence.

6 MEMBER APOSTOLAKIS: Which sentence?

7 CHAIRMAN SHACK: "Detailed analyses of
8 operator manual action on feasibility and
9 reliability." I don't understand what that means. Do
10 you mean the effects of manual action on feasibility
11 or what? It doesn't make sense.

12 DR. LOIS: You are --

13 MEMBER APOSTOLAKIS: The last bullet? Is
14 that the last bullet of the graph?

15 CHAIRMAN SHACK: The words "detailed
16 analyses of operator manual action on feasibility and
17 reliability" don't make sense to me.

18 DR. LOIS: I'm sorry? I don't --

19 MEMBER APOSTOLAKIS: The last bullet.

20 DR. LOIS: "Licensees have the option to
21 submit an exemption or license amendment" --

22 CHAIRMAN SHACK: I understand that part.

23 DR. LOIS: -- "request using detailed
24 analyses of the operator manual actions" --

25 CHAIRMAN SHACK: Of the effect of --

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1 DR. LOIS: -- regarding "feasibility and
2 reliability." Is it beyond --

3 MEMBER APOSTOLAKIS: That whole NUREG
4 refers to how to do such an analysis. This is a bit
5 out of context.

6 CHAIRMAN SHACK: It should be "Detailed
7 analyses of the feasibility and reliability of
8 operator manual action."

9 MEMBER WALLIS: That makes some sense.
10 That makes some sense.

11 DR. LOIS: "Of the feasibility." Thank
12 you. On that basis --

13 MEMBER APOSTOLAKIS: Or, as Erasmia said,
14 "regarding the reliability."

15 DR. LOIS: "Regarding."

16 MEMBER APOSTOLAKIS: I think "of" is
17 better.

18 MEMBER WALLIS: Regardless, you've got to
19 change the order, too.

20 MEMBER APOSTOLAKIS: Yes.

21 DR. LOIS: Actually, it's "of."

22 MEMBER APOSTOLAKIS: Do you have the
23 actual --

24 PARTICIPANT: "Feasibility and
25 reliability."

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1 MEMBER APOSTOLAKIS: -- language of the
2 guide here?

3 DR. LOIS: I have "Operator manual action
4 feasibility and reliability."

5 PARTICIPANT: "Feasibility and
6 reliability."

7 MEMBER APOSTOLAKIS: "For detailed
8 analysis of the feasibility and reliability of
9 operator manual actions." Move the "feasibility and
10 reliability."

11 MEMBER WALLIS: Now I understand what it
12 means.

13 DR. LOIS: Okay.

14 MEMBER APOSTOLAKIS: Well, you always did
15 but just --

16 MEMBER WALLIS: I didn't understand
17 before. No, no, I didn't.

18 MEMBER APOSTOLAKIS: Okay.

19 DR. LOIS: We'll do that. Thank you.

20 In chapter 3, we clarified further what we
21 mean here, what is a simple justification or analysis
22 may be sufficient if it can be shown that a
23 sufficiently long time exists, there are no unique
24 aspects required, and that could run the
25 extinguishment of the fire or the proposed manual

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1 actions are relatively straightforward. So we kind of
2 clarify what we mean by "simple actions."

3 And then, on the other extreme, a rigorous
4 analysis and review is likely to be needed when the
5 time available is relatively short; the operator
6 manual actions are not straightforward, may be more
7 complicated; for example, on multiple actions or the
8 same operator doing multiple tasks; or unique aspects
9 of the fire, such as the extinguishment, is difficult.
10 So you may need just one action to extinguish a fire,
11 but it may be difficult to do it.

12 Any comments to make?

13 MEMBER ARMIJO: Extinguishment?

14 MEMBER APOSTOLAKIS: There is such a word,
15 right?

16 DR. LOIS: There is. The third comment
17 was to discuss the combination of skills and expertise
18 that would be appropriate for an expert panel if used
19 to estimate time margins and noted that potential
20 limitations of the approach may exist.

21 What we did for that is we added a
22 section, appendix B, where the time margin limitation
23 through expert panel has been discussed. And we say
24 that a multi-disciplinary team is recommended of
25 independent specialists, recognized in at least one of

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1 the areas. We cite here some areas needed. And we
2 clarify that the disciplines involved may vary
3 depending on the particular topic being analyzed.

4 For example, the scenario may result in
5 radiation deposit. Then you may need to have
6 radiation deposit experts and health physicists to
7 help out to identify the time margin.

8 And also we discussed the advantages and
9 disadvantages. Advantages are that the participants'
10 knowledge and expertise help determine in the margin,
11 may be used to have reductions in the time and cost
12 allocations compared to other evaluations for
13 retainment and determining the time margins, and
14 leverage on the credibility of the conclusions because
15 of the panel's expertise.

16 However, the disadvantages are that
17 minority views might be eliminated, potentially a
18 dominant member might dominate the results, and
19 evidence that the operators sometimes may be
20 optimistic about the action implementation. And we
21 cite references for guidance for various sources of
22 bias.

23 With that, I complete my presentation.

24 MEMBER APOSTOLAKIS: Any questions?

25 (No response.)

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1 MEMBER APOSTOLAKIS: Okay. Thank you very
2 much for coming back and responding so quickly to our
3 comments.

4 And I understand Mr. Paul Gunter from the
5 public would like to address the Committee for 5-10
6 minutes. Mr. Gunter?

7 DR. LOIS: Thank you.

8 MEMBER APOSTOLAKIS: You are welcome.

9 MR. GUNTER: Thank you very much. I
10 appreciate the opportunity.

11 First of all, I would like to make a
12 correction. I am now employed with a group called
13 Beyond Nuclear with the Nuclear Policy Research
14 Institute, although I will be continuing on with
15 Nuclear Information and Resource Service on some
16 specific aspects and proceedings, such as the Oyster
17 Creek relicensing application, which we are involved
18 in.

19 I would like to raise some of the
20 concerns. I apologize for not being at the June 6th
21 meeting because of a competing commitment, but the
22 public still has a number of broad concerns with
23 regard to the operator manual action.

24 I think that chief among those concerns is
25 that given the scope of the revelation of the operator

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1 manual actions that we see in the industry and the
2 surprise with which it came to the agency, starting,
3 I believe, with pilot fire protection functional
4 inspections in 1999, the concern is that the operator
5 manual actions are being posed to supplant passive
6 physical fire protection features as designated in
7 3(g)(2).

8 And, frankly, we don't believe that that
9 constitutes an equivalent measure of safety. And,
10 despite the comments on staff in reply to the public
11 comment, we still believe that it constitutes a
12 significant a diminishing in defense-in-depth.

13 I think one of the principal reasons that
14 we believe that it diminishes defense-in-depth, first
15 of all, is how are you all going to capture the
16 various uncertainties that can determine a fast-moving
17 fire versus a slow-moving fire.

18 And what we have seen as well is a retreat
19 by staff from the original criterion for the time
20 commitment, where, you know, the two-times factor was
21 introduced.

22 I know the ACRS had some concern about how
23 that factor was introduced. And perhaps, if not, it
24 was a hat trick to put some structure into this
25 uncertainty.

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1 But, again, what we have seen now and what
2 is indicated -- again, I haven't read the -- I don't
3 know that the revised NUREG is actually out for public
4 review yet, but it is my understanding that there is
5 a retreat from the time commitment with regard to the
6 reliability factor in these operator manual actions.

7 And so when you look at NFPA 805 and it is
8 a comparison between performance-based and
9 deterministic-based, you know, they are explicit in
10 there that there need to be engineering qualification
11 that are the equivalent of the deterministic methods.
12 And it's one thing to be able to test and qualify a
13 fire barrier.

14 As problematic as that has been over the
15 history of this industry, you can do it. There are
16 industry measures for time-temperature curve.

17 You know, the public doesn't have
18 confidence in human reliability in being tested,
19 particularly since it cannot be tested under actual
20 conditions that could be encountered during a fire.

21 So we have some real concerns,
22 particularly with regard to what we believe to be the
23 scope of the changes that we are about to make. As a
24 matter of fact, we believe it to be a U-turn from the
25 promulgation of appendix R and 10 CFR 50.48 as a

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1 result of the Browns Ferry fire.

2 You know, I think some of the -- one clear
3 indicator of that U-turn is the fact that the staff,
4 much to our dismay, brought Browns Ferry unit I back
5 online with at least -- I mean, the number is not yet
6 determined but at least 100 operator manual actions
7 that came in under enforcement discretion.

8 So the staff did not have any industry.
9 TVA did not have confidence in demonstrating any
10 equivalency for these operator manual actions so that
11 they could actually meet the exemption requirement.
12 But they were brought in under enforcement discretion.

13 So where is the public confidence in that
14 measure? How can we have public confidence when the
15 fire that promulgated the regulation receives
16 enforcement discretion from the agency?

17 Browns Ferry is not an isolated case.
18 Shearon Harris, which is currently under review by the
19 Government Accountability Office through Congressman
20 Price, also has widespread operator manual action.

21 And so it remains our concern, first of
22 all, that the scope of these operator manual actions
23 I don't think has been bounded by staff. They weren't
24 able to provide you with effective numbers on how many
25 operator manual actions are actually out there.

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1 I think that is still an iceberg that is
2 waiting to be revealed. And, frankly, we are
3 concerned about the fact that this action is being
4 taken prior to actually bounding the scope of the
5 problem.

6 And secondly is that if, in fact, it is
7 supplanting the passive physical fire protection
8 features and there is this question of equivalency but
9 there is also the concern that staff has, for example,
10 the bulk of the operator manual actions as we read it
11 come from the thermal lag fire barrier violations.

12 Now, staff had six years, from 1992 to
13 1998, to review, to do safety reviews, with each of
14 the licensees on their thermal lag corrective action
15 programs.

16 Those corrective action programs were
17 developed. In 1998, all but 17 operators in 24 units
18 had corrective action programs. So in 1998, the NRC
19 issued confirmatory action orders that for those 24
20 units to bring your plants into compliance with
21 3(g)(1) or 3(g)(2) -- and you could use 3(g)(3).

22 What happened, though, was that the
23 operator manual actions were introduced without staff
24 oversight, without the review, without the exemption
25 process.

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1 And we believe and continue to believe in
2 willful noncompliance. And I think the word "willful"
3 here is it's a very strong word. But, yet, we see
4 that in subsequent evaluations, even some of the
5 orders, as best as we've been able to investigate to
6 date, the licensees are out of compliance with orders.
7 I am not here to name names, but we can certainly
8 disclose those. And we are talking those over with
9 the GAO.

10 So there is the issue of enforcement on
11 top of the broad uncertainties associated with these
12 operator manual actions. So, you know, I sincerely
13 think that we are at a very momentous decision here
14 where, in fact, we could be returning to the day
15 before the Browns Ferry fire.

16 And it would be a significant setback,
17 particularly given all of the actions that the staff
18 has put into this issue to date, not only with thermal
19 lag but now we have got HEMIC, we have got MT, FS-195.
20 You know, when does that list end? And how far and
21 how deep into the passive structures for fire
22 protection, which we believe are the front line of
23 fire protection, are we going to remove or cut into
24 that front line and supplant it with what we believe
25 to be the last ditch efforts of operator manual

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1 actions?

2 I will conclude at that point.

3 MEMBER POWERS: Let me ask you one
4 question. You mentioned the problematic nature of
5 qualifying a fire barrier and mentioned the industry
6 standards.

7 A frequent criticism of that industrial
8 standard, ASTM fire standard, is that the heat flux
9 loading unit puts on. It is not representative of
10 anything that could arise in a nuclear power plant.
11 Do you have any comments on that?

12 MR. GUNTER: Well, I believe that, again,
13 I will address it with one of the comments that we
14 made in reply to the NUREG in that fire protection is
15 security infrastructure.

16 And so I believe that the most
17 conservative standards for testing fire protection
18 apply in terms of providing conservatisms to the
19 security infrastructure of these facilities because of
20 the risk and the consequence associated with failure
21 of post-fire safe shutdown.

22 So I think the most conservative standards
23 do apply, particularly when addressing security
24 infrastructure. But, then again, there are the
25 uncertainties of being able to introduce transient

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1 combustibles. You know, that is a hard one to model.
2 And you can't necessarily rely on quantifying
3 combustibles that are in a room when something else,
4 even though it's not jet fuel, could come into that
5 room.

6 So, again, I think it's appropriate to
7 apply the most conservative fire test standards. And,
8 again, that's what ASTM E 119 has derived. And I think
9 that that should be honored and that should be the
10 standard.

11 MEMBER POWERS: It's not entirely clear
12 that it is especially conservative when it comes to
13 hot shorts because it's very hot.

14 MR. GUNTER: Right. Thank you.

15 MEMBER APOSTOLAKIS: Has the Commission
16 approved the use of operator manual actions as an
17 alternative to physical barriers?

18 MR. KLEIN: The Commission withdrew the
19 proposed rulemaking back in March of 2006 that would
20 have allowed as an alternative the use of operator
21 manual action in lieu of a fire barrier in conjunction
22 with detection and suppression.

23 The staff had proposed in that rulemaking
24 an alternative under 3(g)(2) to allow operator manual
25 actions in conjunction with detection and suppression

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1 to address defense-in-depth.

2 So in terms of the characterization that
3 the staff has made a U-turn on appendix R or has
4 diminished defense-in-depth we disagree. We have made
5 no changes to the appendix R rule. We are not
6 proposing any changes to the appendix R rule with this
7 issuance of the NUREG assuming that we get a favorable
8 response from ACRS.

9 The use of this NUREG-1852 will we believe
10 for the first time put in one place a consistent set
11 of criteria for the staff to use to evaluate the
12 application of operator manual actions if a licensee
13 comes in to us under a licensing action, a future
14 licensing action.

15 MR. GUNTER: Could I reply?

16 MEMBER APOSTOLAKIS: Absolutely.

17 MR. GUNTER: I have to respectfully
18 disagree with Alex. The use of suppression detection
19 in 3(g)(2) is used in conjunction with fire barriers,
20 in that case with a one-hour fire barrier. What we
21 are talking about are inoperable barriers now that --
22 the operator manual action or in lieu of lack of cable
23 separation.

24 So I think that the question then becomes
25 how reliable and how much confidence we can have in

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1 human reliability to accomplish an operator manual
2 action, as opposed to passive physical fire protection
3 features, such as 20 feet minimum separation and
4 qualified fire barrier, albeit one hour, but it's
5 still qualified.

6 That is really our concern. It is sort of
7 mixing apples and oranges when you are talking about
8 human reliability and qualifying passive physical fire
9 protection features.

10 MR. KLEIN: We are not suggesting that --
11 and I don't want to get into a debate here because the
12 proposed rulemaking was withdrawn. We understand that
13 there is no equivalency between a fire barrier and an
14 operator manual action.

15 I believe that our proposed rulemaking,
16 the statement of consideration has a fairly lengthy
17 discussion on what the staff's position was if we had
18 moved forward with a final rule.

19 We did not do so. That is why I made the
20 comment that we did not make a U-turn in appendix R.
21 We are not making any changes to the regulations. And
22 neither are we proposing to make any changes to the
23 regulations with this NUREG-1852.

24 MEMBER APOSTOLAKIS: Okay. The Commission
25 disapproved the proposed rule.

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1 MR. KLEIN: No, it did not. We
2 recommended, the staff recommended, that the
3 Commission --

4 MEMBER APOSTOLAKIS: Right.

5 MR. KLEIN: -- withdraw the proposed
6 rulemaking because it did not meet our goal of
7 efficiency and effectiveness --

8 MEMBER APOSTOLAKIS: Right.

9 MR. KLEIN: -- because of the fact that
10 the licensees in their response to the proposed
11 rulemaking had indicated to us that there would be
12 many exemptions submitted.

13 MEMBER APOSTOLAKIS: The question is, has
14 the Commission said that it's okay for a licensee to
15 come and argue that operator actions can be used in
16 arguing for an exemption from appendix R? The
17 Commission has blessed that?

18 MR. KLEIN: Licensees are free to submit
19 an exemption request on their Part 50.12.

20 MEMBER APOSTOLAKIS: Right.

21 MR. KLEIN: Yes. And I will add to it in
22 a second. We issued a RIS back in 2006, Regulatory
23 Issue Summary 2006-10, which clearly explains the
24 staff's regulatory position on the use of operator
25 manual actions and the fact that if a licensee wishes

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1 to use an operator manual action in lieu of the
2 protection requirements under 3(g)(2), that licensee
3 must come in for an exemption request to the staff to
4 receive prior approval to take credit for that
5 operator manual action.

6 And Phil Qualls would like to --

7 MR. QUALLS: Yes. My name is Phil Qualls.
8 I just wanted to add just a little bit.

9 Historically there have been exceptions
10 approved for operator manual actions at one time. I
11 was really the first person here in NRR to stir this
12 issue up. I did training and got NE upset. And I'm
13 the one that sent the letter response to NE and went
14 to CRGR the first time.

15 There have been historically multiple
16 exemptions approved for operator manual actions in
17 lieu of meeting 3(g)(2). I counted. We have a
18 database that ends in -- if we funding the contract,
19 it terminates in like 1992, but I counted like 50 or
20 something at one time. I didn't keep a record of it,
21 but it was on the order of 50.

22 The problem I had because when I was
23 researching the first time we were coming up with
24 criteria and the like is what were the bases for
25 approving them. There's nothing.

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1 Now, the question isn't, is a manual
2 action equivalent to a barrier? It isn't, in no way.
3 Not once did we really say a manual action is
4 equivalent to a barrier, but it's like the standard.
5 It's like if you go back to appendix R, why did they
6 set a three-four rated fire barrier where you need a
7 standard that is adequate for our safety concern?
8 Okay.

9 Now, not all three-hour fire barriers are
10 really adequate for the fire hazard. There is diesel
11 fuel, fuel oil fires, and such that will exceed the
12 ASTME test boundaries. Okay? So the fire barrier
13 won't match that, but do you set a standard that is
14 adequate?

15 So the question we looked at with these
16 manual actions is, what kind of standard will serve
17 for an exemption so that we can review consistently
18 and ensure that it meets an adequate safety level?

19 It's not equivalent to a barrier. A
20 one-hour barrier is adequate. Okay? The manual
21 action is not equivalent to a barrier, but is it in
22 its own way an adequate level to maintain safety?
23 And, actually, having inspected a lot of these in the
24 field, we need some standard out there really bad.

25 And there are multiple examples -- I don't

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1 want to get into anecdotal stories of what I found
2 inspection, but there are some that are just
3 unperformable. I mean, there were some pretty bad
4 examples that we found during inspections.

5 And that's one of the reasons we came up
6 with the original criteria, is we really need some
7 standard because we do get exemptions and we have
8 historically got exemptions. And trying to research
9 the bases for approval for those exemptions there is
10 nothing there.

11 MR. GUNTER: I completely agree with Phil
12 on this. I want to be clear that the public interest
13 community is not opposed to qualifying operator manual
14 action.

15 What our concern is, it's represented, for
16 example, by Shearon Harris, where the operator -- you
17 know, basically where fire barriers were put in was
18 where they couldn't substitute an operator manual
19 action. That is from NRC documents, as we discovered.

20 It is opening that floodgate that is our
21 concern now, particularly given the broad range of
22 inoperable fire barriers that are out there, the
23 concern with regard towards the lack of cable
24 separation.

25 And this is all still being mapped out as

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1 to how extensive the problem is. It is this floodgate
2 that we are concerned about, that, in fact, we are
3 talking about an industry that as we see it has
4 stonewalled the staff, has basically faced down
5 enforcement, and is now in the position to pose
6 supplanting physical fire protection features with
7 operator manual action.

8 MR. QUALLS: And, actually -- this is Phil
9 Qualls again -- Paul, I agree with you.

10 I will relate one plant, one inspection
11 that I wasn't on the team, but I was heavily involved
12 with it here. And that was ANO inspection and the
13 findings and the follow-up and all the panels and all
14 the other stuff that we did.

15 When I looked at what ANO was doing --
16 and, now, they got a white finding and a violation and
17 they are in the middle of corrective actions at this
18 point. They were doing -- if you look at it, they
19 were really shutting down the way Browns Ferry would
20 have shut down in 1974, before the fire, relying
21 totally on manual actions, waiting for something to
22 occur and the operators to respond.

23 And we agree completely that is what we
24 are trying to prevent with the standard. That is why
25 we are trying to get -- we are enforcing the rule.

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1 That is why we are making licensees come in for
2 exemption, so they get staff review and approval and
3 get reviewed to some high-level standard. And that's
4 our goal, too, and we don't disagree with you on that
5 point.

6 MEMBER APOSTOLAKIS: Any other issues?

7 (No response.)

8 MR. GUNTER: Thank you.

9 MEMBER APOSTOLAKIS: Thank you very much.
10 Well, Mr. Chairman, back to you.

11 CHAIRMAN SHACK: We are ahead of schedule.
12 Let's take a short break until 3:30. And then we'll
13 come back and start on our preparation of reports.

14 MEMBER APOSTOLAKIS: You don't have to
15 start at 3:45, right?

16 MEMBER CORRADINI: He gets to move us
17 forward.

18 CHAIRMAN SHACK: We don't need the court
19 reporter anymore.

20 (Whereupon, the foregoing matter was
21 recessed at 3:12 p.m., to be reconvened
22 on Thursday, July 12, 2007, at 8:30 a.m.)
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