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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION
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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS (ACRS)
MEETING OF THE SUBCOMMITTEE ON HUMAN FACTORS

+ + + + +
ROCKVILLE, MARYLAND

+ + + + +
TUESDAY,
DECEMBER 2, 2003

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The meeting was convened in Room T-2B3 of
Two White Flint North, 11545 Rockville Pike,
Rockville, Maryland, at 1:00 p.m., Dr. Stephen L.
Rosen, Chairman, presiding.

MEMBERS PRESENT:

STEPHEN L. ROSEN	Chairman
THOMAS S. KRESS	ACRS Member
DANA A. POWERS	ACRS Member
JOHN D. SIEBER	ACRS Member

ACRS STAFF PRESENT:

MEDHAT EL-ZEFTAWY	Staff, Designated Federal Official
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1 ALSO PRESENT:

2 James Bongarra NRR/DIPM/IROB
3 Paul Lewis RES/DSARE/REAHFB
4 J. Persensky RES/DSARE/REAHFB
5 Susan Cooper RES/DRAA/PRAB
6 John O'Hara BNL
7 Jim Higgins BNL
8 Richard Eckenrode NRR/DIPM/IROB
9 Joel Kramer RES/DSARE/REAHFB
10 Molly Keefe RES/DSARE/REAHFB
11 Gareth Parry NRR/DSSA
12 John Flack RES/DSARE/REAHFB
13 Jose Ibarra RES/DSARE/REAHFB
14 Robert Fuld

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A-G-E-N-D-A

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

1:02 p.m.

CHAIRMAN ROSEN: The meeting will now come to order.

MR. PERSENSKY: Yes, sir.

CHAIRMAN ROSEN: This is a meeting of the Advisory Committee on Reactor Safeguards, Subcommittee on Human Factors. I am Steve Rosen, the Chairman of the Subcommittee.

Members in attendance are Jack Sieber, Tom Kress, and we expect Dana Powers shortly. The purpose of this meeting is to discuss and review the recent updates, the staff drafts of the standard review plan Chapter 18, Human Factors Engineering and Relevant documents.

The subcommittee will gather information, analyze relevant issues and facts, and formulate proposed positions and actions as appropriate for deliberation by the full committee.

Medhat El Zeftawy is the designated federal official for this meeting.

The rules for participation in today's meeting have been announced as part of the notice of this meeting which was published in the Federal Register on November 20, 2003.

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1 A transcript of the meeting is being kept.
2 It will be made available, as stated in the Federal
3 Register notice.

4 It is requested that speakers first
5 identify themselves, speak with sufficient clarity and
6 volume so that they can be readily heard.

7 We have received one request for time to
8 make an oral statement from a member of the public
9 regarding today's meeting, and we will fit that in at
10 the appropriate time.

11 It is clear that we are discussing a
12 matter of great important to the agency and to the
13 public at large, especially in the context of the
14 current discussions on fire safety and manual actions
15 as to whether they would be credited or not. And, in
16 one of the documents we have today, NUREG-1764,
17 addresses that subject.

18 I would note that the full committee will
19 meet beginning on Wednesday, but - Thursday rather -
20 and this discussion, Thursday, December the 4th, the
21 subcommittee will report to the full committee on this
22 discussion beginning at 10:45 a.m. So, any of you who
23 are interested in what we may say to the full
24 committee should plan to attend then.

25 We will now proceed with the meeting.

1 I'll call upon Mr. James Bongarra, from the NRC's
2 Office of Nuclear Reactor Regulations, to begin,
3 though I don't see him. Oh, there he is.

4 MR. PERSENSKY: He is here, but actually
5 I'm going to start it off very briefly.

6 CHAIRMAN ROSEN: All right.

7 MR. PERSENSKY: My name is J. Persensky.
8 I'm from the Office of Research, and have been
9 involved with this effort for some time.

10 I just wanted to give a very brief
11 introduction and sort of a history, in the sense that
12 we have a series of documents that you are going to be
13 looking at today and reviewing, four primary
14 documents. I just wanted to point out that these
15 things have been a long time in coming. We have been
16 working in this area now for probably since the last
17 versions eight to ten years. They actually are the
18 culmination and bringing together of many years of
19 research and many documents, probably 15 to 20 NUREG
20 CRs preceded these, before we put them into the
21 format and form, and to the SRP. There's been a lot
22 of people involved in working on this. Some of them
23 are the people here at the table, but there's others
24 in the audience as well. There's been a lot of
25 cooperation on this between NRR and Research. It's not

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1 been just a research effort, but an effort that
2 includes the actual users in this effort.

3 I wanted to point out that, as I said,
4 there are a long series of NUREG CRs that went into
5 this. Most of them were prepared by Brookhaven
6 National Laboratory, and two of the people responsible
7 for them are also in the audience. John O'Hara has
8 been our Project Manager on most of these products, as
9 well as Jim Higgins has been managing this effort.

10 The other thing is that some of this work
11 is also based on Halden research. In fact, one of
12 them when a lot of work on alarm systems was done
13 directly at Halden on some new research background.

14 I only have this slide up here to show you
15 that these are the four main documents that we're
16 going to be talking about. Jim Bongarra will be
17 leading it off, talking about the SRP. Paul Lewis
18 will be talking generally about the 0711 and 0700, and
19 Susan Cooper will talk about the risk screening
20 process in NUREG-1764.

21 So, with that, I'd like to turn it over to
22 Jim Bongarra.

23 MR. BONGARRA: Good afternoon. My name is
24 Jim Bongarra, and I am with the NRR, Division of
25 Inspection Program Management, in the Reactor

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1 Operations Branch, with the Section on Operator
2 Licensing and Human Performance. I am the NRR
3 Technical Coordinator for the material that we are
4 going to be presenting before you today.

5 I'll introduce my co-presenters, actually,
6 a little further here in a moment, but what I'd like
7 to do initially here is to kind of explain the purpose
8 of today's presentation.

9 We are here today to brief the Human
10 Factors Subcommittee on the staff's recent efforts to
11 revise SRP Chapter 18, that is, the chapter on Human
12 Factors Engineering, and to discuss with you the
13 revisions that we have made to two important guidance
14 documents related to human factors engineering, NUREG-
15 0711 and NUREG-0700.

16 In addition, as part of the standard
17 review plan revision, the staff has developed a risk-
18 informed guidance document, and, Chairman Rosen, you
19 referred to that earlier as the, indeed, NUREG-1764,
20 and we'll also be discussing that with you.

21 Our goal is to obtain the ACRS'
22 endorsement of the standard review plan revision and
23 the associated NUREGs, and we're going to, hopefully,
24 be able to do that on Thursday when we, indeed, meet
25 with the full committee.

1 In addition to my introduction and
2 overview of today's presentation, as J. mentioned, I'm
3 joined by Paul Lewis, who is the Research Project
4 Manager for this effort, and J., of course, whom you
5 all know. They will be discussing in more detail the
6 revisions made to NUREG-0711 and NUREG-0700.

7 Paul and J. will be followed by Susan
8 Cooper, who is to my right. She's also from the
9 Office of Research, and Susan will discuss with you
10 the details of NUREG-1764, and I believe she'll really
11 focus her remarks and discussion on a portion of the
12 NUREG which has to do with the screening process,
13 which is a major component of NUREG-1764. Susan has
14 been a principal contributor from Research and a
15 reviewer of NUREG-1764.

16 We've also acknowledged, indeed, the
17 presence of two of our contractors, Jim Higgins and
18 John O'Hara from Brookhaven. They have been very
19 instrumental in the development work that's gone into,
20 as J. had mentioned I guess earlier, NUREG-0700, 0711
21 and, indeed, 1764.

22 I'd also like to acknowledge Doctor Gareth
23 Parry, who is from the Office of Nuclear Reactor
24 Regulation. He's the Senior Level Technical Advisor.
25 I know you are probably familiar with him, he's been

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1 before you in the past. Gareth has also participated
2 as both a contributor and a reviewer to the
3 development of NUREG-1764. So, Doctor Parry is here.

4 I'd also like to mention as well, I don't
5 believe he's in the audience today, but Marty Stutske,
6 who is with the Probabilistic Risk Assessment Branch
7 in NRR, has also contributed as a reviewer to the
8 screening methodology in NUREG-1764.

9 Okay, this is the agenda as I'm seeing it
10 for today. Our agenda, again, will cover these main
11 major topics.

12 And, because it's been a while since we've
13 actually been before the subcommittee with this
14 material I'd like to just say a few words about each
15 of the topics to kind of reintroduce the issue or the
16 factor here of the standard review plan and kind of
17 set the stage for some of the more detailed
18 discussions that we're going to have this afternoon,
19 and I'll discuss, to some degree, SRP Chapter 18 in a
20 little bit more detail.

21 Simply stated here, Chapter 18 has been
22 around really since the early 1980s, and it was
23 originally formatted in really two major sections. We
24 had a design control room review portion of the SRP,
25 and a section on the safety parameter display system.

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1 And, certainly, Chapter 18 has been revised since, and
2 I'll discuss the revisions in detail in the next
3 slide.

4 NUREG-0711, this was originally prepared
5 back in the early days of - early days, back in the
6 early '90s, when the staff was involved in doing
7 advanced reactor reviews. It was known at that point
8 in time as the program review model, PRM. NUREG-0711
9 is the NRC's principal human factors engineering
10 guidance document.

11 The program review model was first
12 published as NUREG-0711 in 1994, once again, to
13 support advanced reactor design certification reviews.
14 It was previously revised in 2002, that is, Revision
15 1 to NUREG-0711 came out in 2002, and as I mentioned
16 earlier, Paul and J. will discuss this in more detail
17 so I won't go into a great bit of detail on NUREG-
18 0711.

19 NUREG-0700, this document dates back to
20 1981, and it's been used extensively by the NRC and
21 the industry in the wake of the TMI accident, to
22 complete, basically, the design control room reviews,
23 the detailed control design reviews, excuse me, and
24 human-system interface upgrades. It's the agency's
25 principal document for reviewing human factors

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1 engineering and upgrades to human-system interfaces.

2 Again, Paul and J. will discuss NUREG-0700
3 in more detail, so I'll just move on here.

4 I might just mention, all three of these
5 documents, and I guess J. did indicate this too, they
6 are used extensively by the U.S. and foreign
7 utilities, and also by non-nuclear industries as well.

8 NUREG-1764, this is the latest edition to
9 the guidance that supports our human factors
10 engineering reviews. NUREG-1764 is a risk-informed,
11 graded guidance document, and its purpose is to help
12 our human factors engineering reviewers in NRR to
13 consistently determine the appropriate level of review
14 effort to put into evaluating license amendment
15 requests that credit human actions.

16 The guidance in NUREG-1764 consists of
17 three parts. There's a risk screening portion,
18 there's guidance that the human factors engineering
19 reviewers use to evaluate from a human factors
20 engineering perspective the licensee's request for a
21 change that involves crediting human actions, and
22 there are criteria in 1764 for making a decision on
23 the final acceptance of the change request.

24 In the recent past, and we continue as
25 well, NRR has been receiving many of these types of

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1 requests from licensees, that is, requests that
2 involve crediting human actions. Licensees are
3 examining the design and licensing bases, and are
4 coming up with modifications that many times involve
5 the use of manual operator actions, sometimes to
6 supplement equipment changes that they make, and
7 sometimes the actions that they are crediting are
8 compensatory actions.

9 Again, Susan Cooper will address the risk
10 screening process that is part of NUREG-1764, and will
11 also explain the human factors review aspects of the
12 guidance a little bit later in the presentation.

13 I might just mention that the revisions to
14 all of these documents were sent out for public
15 comment in December of 2002, and I believe the
16 responses to the public comments that were received
17 have, indeed, been included in the packet that was
18 provided to you.

19 CHAIRMAN ROSEN: I will note, if I can
20 interrupt for a moment -

21 MR. BONGARRA: Please.

22 CHAIRMAN ROSEN: - that the Commission is
23 separately considering revisions to 10 CFR 50.48, Fire
24 Protection Rules, which would allow licensees to
25 voluntarily implement changes to their fire protection

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1 design basis as agreed to by NFPA-805, so the
2 Commission's action, if it chooses to do so, would be
3 to endorse NFPA-805 in a way through the regulations,
4 and, ultimately, by reg guide.

5 NFPA-805, as I said, allows voluntary -
6 it's a voluntary means to risk-informed fire
7 protection rules, and in doing that analysis one
8 would, as a licensee, need to analyze manual actions.
9 So, there is a tie, and this is my point, between the
10 Reg 1764 and upcoming rulemaking on fire protection.

11 We'll be talking about scheduling with
12 this document at some point in the future, and it's
13 going to be important to properly - proper utilization
14 of the new regulations in 50.48 to have NUREG-1764
15 available. There are so many scheduling issues that
16 we might want to examine for a while.

17 Do you have a scheduling discussion here
18 of when you are going to get all this done, you
19 actually intend to release these documents in their
20 revised form?

21 MR. BONGARRA: No, we don't. We have not
22 provided a schedule. In one of the - the next steps,
23 Chairman Rosen, we will take after we review this with
24 the committee, would be to go to CRGR as well and
25 receive their input.

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1 So, we are taking this in a stepwise
2 fashion, so, hopefully, and I don't see any kind of a
3 problem myself in terms of trying to integrate or
4 being able to integrate the guidance that we have with
5 the activity related to 805.

6 MR. PERSENSKY: We expect that after this
7 ACRS review and CRGR review we would incorporate any
8 comments that come from these two reviews, and then we
9 are ready to publish them as final. So, these would
10 be the final documents probably in a few months.

11 We have been interacting and interfacing
12 to some extent with the fire people on this, and are
13 aware of their issues with regard to manual actions.

14 CHAIRMAN ROSEN: The Commission's schedule
15 with 50.48 is some time in late spring.

16 MR. PERSENSKY: Well, these will be out
17 there before that.

18 CHAIRMAN ROSEN: Spring 2004.

19 MR. PERSENSKY: Yes.

20 MR. BONGARRA: On this next slide -
21 actually, let me just make one comment here, if I may,
22 I was remiss and neglected initially in my remarks, I
23 neglected to identify two other individuals, indeed,
24 and my apologies for that, who were and have been
25 involved in the work on all of these documents, Mr.

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1 Dick Eckenrode, who is with NRR, has been a
2 contributor to all of these documents for a number of
3 years, and Joel Kramer from the Office of Research, is
4 very heavily involved and has been over the years in
5 development of NUREG-0711 and 0700, in particular.
6 So, my apologies for not acknowledging them initially.

7 Chapter 18 is the agency's principal
8 guidance for reviewing human factors engineering
9 aspects of license designs, redesigns as well as human
10 factors engineering related changes to operating
11 plants. Chapter 18 is a high-level source document
12 that we, as human factors engineering reviewers, use
13 to identify other human factors and related guidance.
14 For example, NUREG-0711, 0700 and 1764 are all
15 referenced in Standard Review Plan Chapter 18.
16 Chapter 18, human factors engineering, also cross
17 references to other chapters in the Standard Review
18 Plan that are related to human factors engineering.
19 For example, cross references Chapter 13, sections in
20 Chapter 13. We are not going to talk about Chapter 13
21 in detail today, but there are sections in Chapter 13
22 that we use as reviewers that relate to training,
23 staffing and qualifications, operating - emergency
24 operating procedures. So, those references are also
25 in Chapter 18.

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1 The most recent revision to Chapter 18,
2 before this one, was back in 1996. There was a major
3 revisions to Chapter 18, to address design
4 certification of advanced reactors. It was part of
5 NRC's, or NRR's I should say, overall effort to revise
6 and upgrade the Standard Review Plan, essentially, in
7 response to the several evolutionary and advanced
8 reactor designs that the NRC was involved in at the
9 time.

10 The 1996 version of Chapter 18 was
11 published as a draft, as a work in progress. So, it
12 was never reviewed, to the best of my knowledge, by
13 the ACRS or CRGR. However, it did receive public
14 comment and, actually, there were a few comments that
15 were made to Chapter 18 in that time frame.

16 Well, since 1996, since the revision in
17 1996, there have been numerous updates to several
18 documents that are referenced in Chapter 18. For
19 example, NRR upgraded sections of Chapter 13 a few
20 years ago related to organization management and
21 staffing, and we did this to better address the issues
22 that we were dealing with at the time related to
23 license transfers.

24 We also recently came before the ACRS with
25 a Chapter 13 revision related to extended power

1 upgrade issues, and as we'll see shortly, since 1996
2 there has been much in the way of progress made to
3 upgrading guidance in both NUREG-0711 and NUREG-0700,
4 to better address the changes in technology of human-
5 system interfaces. This has all been done, needless
6 to say, so that the staff can remain in line with the
7 industry and ready with the latest guidance to
8 evaluate issues that are posed by digital technology.

9 Once again, Chapter 18 is a high-level
10 framework for all the NRC's human factors engineering
11 reviews.

12 The staff performs human factors
13 engineering reviews to provide a reasonable assurance
14 and safe plant operation. The staff reviews upgrades
15 that are made to human-system interfaces and
16 procedures in training and staffing, et cetera, in
17 operating plants.

18 10 CFR 50.59 process is typically a venue
19 for these types of changes that come to us for review
20 that require the use of Chapter 18. Using guidance in
21 Chapter 18, the staff also reviews changes that affect
22 credited human actions in licensee safety analysis
23 reports.

24 The human factors aspects of advanced
25 plant designs that are current under 10 CFR 52 are

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1 also addressed in the guidance contained in Chapter
2 18.

3 Just briefly here, let me review the
4 structure of SRP Chapter 18, and the chapter is
5 structured in three review areas, corresponding to the
6 types of reviews performed, new plants, control
7 modifications and reviews to changes to human actions.

8 What I'd like to sort of emphasize here in
9 this next slide, or in this current slide rather, is
10 that there's a relationship of the three applications
11 within the Standard Review Plan to the NUREG guidance
12 that we are going to talk about.

13 Admittedly, the slide is a little bit
14 contrived due to the fact that the documents don't
15 precisely line up this way, but, nonetheless, this is,
16 I think, a fair representation.

17 NUREG-0711 was developed as the program
18 review model for reviewing new plant designs, as I
19 mentioned earlier, and it's the principal guidance
20 document for this section of the Standard Review Plan.

21 For Section 2B, control room
22 modifications, NUREG-0700 is the principal guidance
23 document that the staff uses to review control room
24 upgrades and modifications.

25 NUREG-0711, however, has overall design

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1 program elements, and all the essentials and high-
2 level characteristics that should be part of any
3 control room modification or upgrade effort, so it's
4 also a document that's used in this section of the
5 Standard Review Plan.

6 And, the third major subdivision of the
7 Standard Review Plan, again, is the recently enhanced
8 portion that provides risk-informed guidance for
9 reviewing license amendments that credit manual
10 action.

11 Review philosophy of Chapter 18. This
12 slide, hopefully, provides support and some credence
13 to why human factors engineering reviews are performed
14 and why Chapter 18 of the Standard Review Plan is
15 important.

16 Though there's not a whole lot in the way
17 of - in 10 CFR 50, that one can point to related to
18 human factors engineering, both 10 CFR 50 and Part 52
19 do acknowledge aspects of human factors engineering as
20 requirements to be met. 50.34F, for example, talks
21 about the TMI action plan items, and it discusses
22 requirements for conducting a control design review on
23 an SPDS console, and having a state-of-the-art control
24 room, for example.

25 10 CFR 52, for new plants, invokes Part 50

1 and it strengthens the applicability of NUREG-0711 as
2 applied to advanced plants. As the slide shows, human
3 factors engineering-related problems are most often
4 the result of flawed early design decisions, little or
5 no real consideration given to the role of humans in
6 the process control, poor human-system interface
7 design that can result in hardware and software that
8 are, essentially, not user friendly, and sometimes may
9 even be counterproductive.

10 The emphasis that we have given to human
11 factors engineering, and I believe it's reflected in
12 the Standard Review Plan and NUREG-0711, is that a
13 human factors engineering evaluation should be started
14 early in the design process, and that it's an
15 iterative process, and done properly it can save
16 significant time, and money, and personnel resources.

17 This concept of early implementation of
18 human factors engineering and plant design has
19 actually been followed by all of the evolutionary and
20 advanced plants that have been certified to date by
21 the NRC.

22 It's also a process, as I'm aware, that's
23 being implemented, for example, with the South African
24 pebble bed modular reactor. Of course, we haven't seen
25 that, but, nonetheless, they are utilizing a number of

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1 these concepts as well

2 Just a few words, if I may, about the
3 review approach that's followed in Chapter 18. The
4 human factors engineering program is identified in the
5 SRP and the companion NUREGs, especially NUREG-0711
6 follows a structured approach. As the slide shows, it
7 begins with an analysis, essentially, of high-level
8 functions and it progresses to exacting human-system
9 interface details of individual instrumentation. It's
10 a process that should span the plant's life cycle of
11 design, and implementation, and maintenance and
12 modifications.

13 What we are attempting to do now in this
14 latest revision to Chapter 18, is to provide a graded,
15 risk-informed approach in concert with the
16 Commission's direction to our regulatory review, or at
17 least we are trying to do that at the moment for a
18 portion of the guidance in Standard Review Plan
19 Chapter 18.

20 CHAIRMAN ROSEN: Why do you say partially?

21 MR. BONGARRA: The reason I say partially,
22 and I'll qualify that, sir, is because we have really
23 looked at risk informing the portions for reviewing
24 crediting operator actions that's related to NUREG-
25 1764, and I hesitated to really extend that concept to

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1 the other portions of the Standard Review Plan at this
2 time because the intent was really to risk inform that
3 one aspect of our review.

4 CHAIRMAN ROSEN: As opposed to, for
5 instance, control room design?

6 MR. BONGARRA: Yes.

7 The next slide is our revisions. Okay,
8 let me just quickly say, specifically, what we've
9 revised in Standard Review Plan Chapter 18, as issued
10 in 1996, these, indeed, are what I would characterize
11 as the major changes to Chapter 18 since 1996. We've
12 modified review elements and acceptance criteria to
13 agree with NUREG-0711 Revision 2. We've added review
14 of plant modifications and the section on crediting
15 human actions, and, once again, we've added the graded
16 approach to human factors engineering review based on
17 risk insights.

18 Once again, Paul, and J., and Susan will
19 go into much more detail on these areas than I have.

20 Okay, why did we make the changes? In
21 addition to wanting to make certain, okay, that the
22 staff is prepared to meet future challenges to human
23 factors engineering, posed by, for example, digital
24 technology, the changes made to the Standard Review
25 Plan address feedback that we've actually received

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1 from the public and our stakeholders. And, over the
2 years, since the staff completed the evolution of
3 reactor reviews we've also learned some lessons, and
4 we've attempted to incorporate the results of these
5 lessons learned into our new guidance that's reflected
6 in this revision to Chapter 18.

7 We've also received feedback from
8 experience of foreign countries who reviews the
9 Standard Review Plan and related guidance documents to
10 upgrade their plants or to design new ones.

11 For example, Bresno, we've received
12 feedback from the experience that they've had in
13 working with soft controls and computerized
14 procedures.

15 We've also attempted to incorporate
16 results from various research efforts into the
17 revision. Research, for example, in hybrid control
18 rooms, the use of computerized procedures, et cetera.
19 I think J. also mentioned earlier about the work that
20 Hallman has been doing on various areas of digital
21 technology, soft controls, et cetera.

22 CHAIRMAN ROSEN: Before we get away from
23 this discussion that you just provided on research,
24 let me be a little argumentative, if I can, without
25 being disagreeable.

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1 I went back and looked at our September -
2 the ACRS' September 24th letter, September 24, 2002,
3 on the human factors and human reliability analysis
4 research plans, which is now about a year old.

5 And, for the life of me I could not see in
6 any of these documents how some of the points we were
7 making in that letter were incorporated in what you
8 are now doing. Maybe it's because it's too soon,
9 because these were comments on research planning, and
10 yet, I have a sense that maybe you didn't get this
11 letter, or maybe it wasn't taken real seriously.

12 I think it would be helpful for the
13 committee, the full committee, for you to, in the
14 context of what you are talking about, at least take
15 a pass at what you think of this letter and how it
16 relates to what you've done here and what you may be
17 doing in the future. So, could you think about that
18 between now and Thursday?

19 MR. PERSENSKY: We will do that. We did
20 receive the letter, whether we got it may be another
21 issue.

22 CHAIRMAN ROSEN: You may not have got it,
23 but you received it.

24 MR. PERSENSKY: And, I will say, and we
25 will address that the Thursday meeting, but, as you

1 said, most of these documents were already pretty much
2 completed a year ago, and have been going through the
3 review and public comment period. So, there wasn't a
4 whole lot of opportunity since then, at that time, to
5 incorporate a lot of what may have been said in that
6 letter.

7 I have to confess I don't remember much
8 about that letter, except something about - I know
9 there was something about the simulators, and some
10 issues associated with that.

11 CHAIRMAN ROSEN: Well, there was a
12 discussion of control room staffing that exists in the
13 advanced nuclear plants, and to a degree you may have
14 addressed that, or maybe it's Chapter 13 that
15 addresses that.

16 But, if you would do me the favor of
17 rereading this letter and being available to comment
18 on it for Thursday, I think -

19 MR. PERSENSKY: We'll be glad to do that.

20 CHAIRMAN ROSEN: - the ACRS likes to keep
21 track of whether the agency is responding at all, and
22 if so where.

23 MR. PERSENSKY: Some of those things, as I
24 mentioned at our last meeting in October, we have
25 addressed from a staffing issue, but that's separate,

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1 it is Chapter 13, and that will be brought to you in
2 a couple of months. But, we'll go back and look at
3 the letter and be prepared to address any issues on
4 that.

5 CHAIRMAN ROSEN: Good.

6 MR. PERSENSKY: Thank you.

7 CHAIRMAN ROSEN: Well, I was just picking
8 up on your last bullet on page 12 and thinking about
9 that, incorporate NRC research on human factors
10 engineering, and thinking we had made comment in that
11 area, and I don't see the thread. Okay.

12 MR. BONGARRA: All right.

13 This final slide, I'd just like to kind of
14 quickly summarize that SRP Chapter 18 has been used by
15 NRR for over 20 years. It was last revised in 1996,
16 as part of the agency's overall effort to update and
17 upgrade the Standard Review Plan, aligning it with
18 advanced reactor reviews.

19 SRP Chapter 18 is the principal source of
20 human factors engineering guidance for the NRC, and as
21 will be discussed in more detail SRP Chapter 18
22 relies, indeed, on several sources for detailed
23 guidance to implement human factors engineering
24 reviews.

25 Unless the subcommittee has further

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1 questions at this point, I'll certainly turn the
2 presentation over to Paul Lewis, and we'll discuss
3 NUREG-0711 and 0700 in more detail.

4 MR. LEWIS: My name is Paul Lewis. I'm with
5 the Office of Research, Reliability, Effectiveness,
6 Assessment of Human Factors Branch, in the Human
7 Factors Group under J. Persensky. J. And I will be
8 talking about NUREG-0711 and NUREG-0700.

9 NUREG-0711, what is it? It's a complete
10 set of the basic human factors review elements for
11 nuclear power plants. It's a complete set, not only
12 in the meaning that it contains all the elements, but
13 also the fact that it's intended to cover all the
14 entire life cycles of plants, from the design through
15 operations.

16 It includes reviews of the design process
17 and the design products.

18 Elements for NUREG-0711 are adapted in
19 other documents for specific types of review and I'll
20 show you a couple of examples of that.

21 Here on the next slide 16 shows the 12
22 review elements. This is a life cycle planning
23 analysis all the way through the implementation and
24 operation. These are the 12 elements here.

25 MR. SIEBER: Sir, could you talk into the

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1 mike?

2 MR. PERSENSKY: You have to talk into the
3 mike.

4 MR. LEWIS: Oh, I'm sorry.

5 MR. PERSENSKY: This is going to be tricky.

6 MR. LEWIS: Okay, you are going to have to
7 look at it. Did I get it?

8 DOCTOR KIRBY: You need a mirror.

9 MR. PERSENSKY: Actually, my job is to
10 switch slides and hold the base.

11 CHAIRMAN ROSEN: You aren't certified.

12 MR. PERSENSKY: I'm not licensed yet, I'm
13 still trying.

14 CHAIRMAN ROSEN: We're likely to certify
15 you in switching slides.

16 DOCTOR KIRBY: We'll not talk about that in
17 our letter.

18 MR. PERSENSKY: Thank you.

19 MR. LEWIS: The first one is human factors
20 engineering program management, that's the team and
21 the qualifications of the team at the plant for human
22 factors engineering. Operating experience review,
23 function analysis, and allocation, task analysis,
24 staffing and qualifications, human reliability
25 analysis. This doesn't refer to the quality of the

1 HRA, but the integration of the HRA into the human
2 factors function, the kind of information that human
3 factors people give the HRA people and the risk
4 importance of the tasks that the HRA people will in
5 turn give back to the human -

6 CHAIRMAN ROSEN: In other words, this is
7 what the human factors people give to the PRA analyst
8 who is doing the human factors input to the PRA.

9 MR. LEWIS: Yes.

10 Now, the design process, the human-system
11 interface design, and the next NUREG that I'll talk
12 about, NUREG-0700, is detailed guidelines for this
13 one, but this one has an element.

14 Procedure development is the next element.
15 Details for procedure review are in Chapter 13 of the
16 SRP, but this introduces the element.

17 Training program development, again,
18 details of training are in different portions of the
19 SRP.

20 Human factors verification, verification
21 and validation, and then the two that were added for
22 this revision of 0711 are design implementation and
23 performance monitoring. That completes the life cycle
24 at a plant.

25 So, this slide shows the format of the

1 elements, and I won't go into it, but I just wanted to
2 emphasize that this is a standardized format, and
3 NUREG-0711 does have a standardized format. It's very
4 systematic. The group of NUREGs are also systematic
5 and organized as a group. I'll get into that later.

6 This is the chart that J. Showed you
7 earlier. The top row there, and the three boxes, are
8 all part of SRP, Chapter 18. The three applications
9 of Chapter 18 at the present time are New plant,
10 modifications to a control room, and changes to human
11 action. And then, you see that NUREG-0711 is
12 highlighted, that's the one I'm talking about, I just
13 wanted to show you the relationship between these
14 NUREGs.

15 And, as I said, the elements in 0711, in
16 0711 it's a complete set of the elements, and they are
17 extracted, these elements are extracted for particular
18 uses in different places. For example, in the SRP for
19 the new plant, it uses pretty much all of the 12
20 elements in 0711. The elements of 0711 are also
21 extracted in the second application of Chapter 18,
22 which is the modification of a control room. And, as
23 we go into greater detail when we discuss NUREG-1764,
24 the human factors review portion of that is also based
25 on 0711.

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1 And, as I mentioned previously, just to
2 show you in this slide here, one of the 12 elements
3 was the human-system interface design review
4 guideline, and that's represented in NUREG-0700. So,
5 one of the 12 elements is represented by NUREG-0700.

6 MR. PERSENSKY: That slide is somewhat
7 incomplete, because there are a series of other NUREGs
8 that address some of the issues, like procedures,
9 training, so we just didn't put all those on here
10 since we are only talking about particular factors.

11 MR. LEWIS: We have just revised NUREG-
12 0711, and I'll review some of the changes from the
13 previous version. This version applies to all human
14 factors reviews. The previous version concentrated on
15 advanced reactors. This is a complete set of human
16 factors review elements. We've made it a complete set
17 by adding two elements, the design implementation and
18 the performance monitoring. We also made changes in
19 the following elements, function analysis and
20 allocation, HRA, human-system interface, and
21 verification and validation. But, most of the
22 guidance already existed in previous documents.

23 Now I'll go to NUREG-0700, which is human-
24 system interface design review guidance.

25 Oh, do you have any questions on 0711?

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1 Okay, we'll go on to 0700.

2 This just repeats, to put everything in
3 context, we are moving on to 0700 now, what is it?
4 0700 is a complete set of guidelines for the review of
5 human-system interfaces, and you are going to see by
6 the size of this document there was quite a bit of
7 detail there.

8 CHAIRMAN ROSEN: I didn't bring it with me
9 from Texas. I was hoping someone would have a copy.

10 MR. LEWIS: Yes, we do have a copy.

11 CHAIRMAN ROSEN: Wouldn't have to use all
12 that jet fuel to get it here.

13 MR. LEWIS: You read it all.

14 CHAIRMAN ROSEN: Oh, I read it all. I was
15 hoping there wouldn't be any -

16 DOCTOR KIRBY: Well, you had a chance to
17 read it in '81 or '82, right?

18 CHAIRMAN ROSEN: Yes, I had the chance to
19 react to it, as a matter of fact, in those days being
20 in the plant or plants.

21 MR. SIEBER: Could you give us a general
22 idea, like Steve, I remember the original NUREG-0700,
23 what are the major changes? You are on the second
24 revision now.

25 MR. LEWIS: Yes.

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1 On the first revision, it revised to add
2 review guidance for digital, and during that process
3 some gaps in the review guidance were identified. And
4 so, this revision primarily fills those gaps.

5 MR. SIEBER: Fills the gaps, okay. It is
6 basically the same as it was.

7 MR. LEWIS: Yes.

8 CHAIRMAN ROSEN: Well, it talks more about
9 digital, does it not?

10 MR. LEWIS: Yes.

11 CHAIRMAN ROSEN: More about digital.

12 MR. LEWIS: Yes, Revision 1 added a number
13 of sections on digital, and Revision 2 adds a couple
14 more.

15 MR. SIEBER: Well, the original did not
16 have any.

17 MR. LEWIS: That's correct, right, so this
18 brings it up into the modern age, so to speak.

19 Another change was, we had some
20 information on process that we moved into 0711. So,
21 0711 focuses on process, whereas this is review
22 guidance.

23 Also, the previous version of 0711 had a
24 section on VAV, verification and validation. That was
25 also moved to 0711 because that's a more proper place.

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1 So, that, in a nutshell, is what 0700 is.

2 CHAIRMAN ROSEN: Thank you.

3 MR. LEWIS: Now, I might mention this is a
4 very large volume, and it's very detailed, but it is
5 that way for a purpose, and that is the reviewers want
6 it that way. They appreciate the detail. And, I must
7 emphasize that these are guidelines, these are not
8 requirements.

9 When a reviewer reviews a human factors
10 interface they will look at it in detail, and if
11 something does not follow these guidance they'll make
12 a note, but there's no requirements to follow the
13 guidelines.

14 CHAIRMAN ROSEN: It becomes an HED then?

15 MR. LEWIS: AGD?

16 CHAIRMAN ROSEN: HED, human error
17 discrepancy.

18 MR. LEWIS: Oh, yes.

19 CHAIRMAN ROSEN: It's not a deficiency,
20 necessarily.

21 MR. LEWIS: That's right.

22 And then at the end, they look at the
23 whole package. There might be some discrepancies, but
24 they look at the whole package.

25 CHAIRMAN ROSEN: One of the ACRS' concerns,

1 which we voiced in one letter, I'm not sure it's the
2 one I was just talking about, that given the nature of
3 0700 being very, very prescriptive, in terms of the
4 proper angle of - for example, the proper angle of a
5 person's 95th percentile woman's height eye to a
6 control room instrument should be, and it was our
7 concern that these would become de facto standards, de
8 facto regulations.

9 And, what can you say about that, in your
10 experience, oh, yeah, this was, I admit - Med El-
11 Zeftawy just gives me the letter, this was our 1995
12 letter, November, where we expressed that concern,
13 what's been your experience with that?

14 MR. BONGARRA: Well, there's no question
15 that, as Paul has identified here, that the guidance
16 document is quite detailed.

17 CHAIRMAN ROSEN: It's extraordinary, let's
18 be clear, it's extraordinarily detailed and
19 prescriptive. It's a micro manager of the first kind
20 if it's read that way.

21 MR. SIEBER: It's the way it was
22 interpreted at the time, too.

23 CHAIRMAN ROSEN: Well, yes, and I think
24 that was our concern.

25 So now I'm giving you a chance to hit the

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1 ball out of the park.

2 MR. BONGARRA: Well, I guess in defense of
3 this, I've been on both sides of this fence. Before
4 I came to the NRC a long time ago, I had the
5 opportunity of actually utilizing this document to do
6 control room designs from a standpoint of working with
7 utilities. And, all I can say with regard to that, or
8 what I can say with regard to that is, basically, that
9 this was a boon to our effort because there was
10 basically nothing in existence of this nature for us
11 to do a control room design review and retrofit.

12 I mean, there was information that was,
13 perhaps available from military source documents, et
14 cetera, but a document such as this, where all of
15 these principles and guidelines were assembled under
16 one cover was not available, and that leads me to,
17 really, what I really want to emphasize here, I guess,
18 is that what we have in front of us is something
19 that's not - it's not a contrived document that the
20 agency has come up with, it's a document that
21 assembles human factors engineering principles and
22 guidance with practices.

23 So, it draws on sources of information
24 from various venues for various applications, and
25 there is an attempt there, too, to tailor those as

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1 well as possible to the needs of the nuclear power
2 facility.

3 So, is it - you know, is it prescriptive?
4 I guess I don't see it being anymore prescriptive
5 than, perhaps, a standard that's related to strictly
6 the hardware design. I think, again, the information
7 that's in the document is information that has a
8 level, if you will, of - there's a pedigree to it, and
9 I think if, John, if you would like to, perhaps, if I
10 may call on John O'Hara, who has been working with
11 this for a good while, John, if you have anything to
12 add to what I've said, or change what I said.

13 MR. O'HARA: Sue.

14 I'm John O'Hara, from Brookhaven Lab.

15 A few things to point out about this
16 document is, it contains guidance that the staff would
17 use for any type of control room review. So, it has
18 guidance related to the old, you know, analog
19 instruments and controls, as well as the new digital
20 ones.

21 So, if you think of how it is applied to
22 any one review, there's only a subset of this
23 information that would be applicable. So, that's one
24 thing.

25 So, it's a big document, not ever intended

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1 to be used from cover to cover. You select out those
2 portions that are relevant to the review. The
3 designers use all sorts of different approaches to
4 human-system interfaces, and the staff guidance sort
5 of was intended to cover all the various options that
6 they might be presented with.

7 So, you really have a broad range of
8 technologies that are addressed here.

9 The other is, human performance, when you
10 look at human performance, very often the devil is in
11 the details. You mention a meter that might be
12 placed, you know, in a certain location, if you can't
13 read that meter, and that meter is giving you
14 important information to do your task, or if you
15 spread the meters out so that you can't, you know,
16 possibly get to all of them in order to take your
17 action, your performance is going to suffer.

18 So, a lot of these details that are in
19 here really reflect the kinds of considerations that
20 go into assuring reliable performance. And there's,
21 you know, a computer analogy to that, too. I mean,
22 just as you can make information hard to collect with
23 analog instruments right out across a control room,
24 you can make it very difficult to access information
25 in a timely manner in a computer system. So, there is

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1 that analog in the digital world that you have to the
2 older instrumentation. And, really, that's the
3 orientation of this guidance. It's very broad,
4 because it's trying to cover all the potential design
5 options that the staff may have to review.

6 MR. PERSENSKY: I think so far the answers
7 have addressed the fact of the need for the detail,
8 but from the standpoint of the regulatory nature of
9 how this is interpreted, part of it is a familiarity
10 with the way the NRC regulatory documents are
11 structured. I mean, a rule that's in 10 CFR is the
12 only thing that's a real requirement, unless it
13 becomes a tech spec or order.

14 These are guidance guidelines. They are
15 guidelines, you know, in the sense of 0700 as a
16 guideline for the review of designs done by the staff.
17 This is a document for the staff to use. The industry
18 does, in fact, pick it up, and they give them to the
19 DCRDRs and use it. But, in fact, EPRI, under a IPO
20 contract, has now developed a companion document, or
21 are still developing, I guess it is out now, that is
22 a design guide, which is at least as detailed and is
23 intended for use by the industry in the design as a
24 review guide for us. It relies very heavily and
25 refers very heavily to this document. But, that part

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1 of it from the design standpoint has come out from
2 EPRI. Again, it's more or less an understanding of
3 the process.

4 But, in practice, we all know that if we
5 are going to review it this way, it's generally going
6 to be done that way, even though there are other
7 options. I mean, we say that in reg guides, we say
8 that in NUREGs, we say that in just about every
9 document. This is one way, this is what the staff is
10 going to do, but you have an option as a utility, or
11 as a vendor, to present a different approach, as long
12 as you have the justification for that approach.

13 MR. SIEBER: Well, generally, what you ask
14 the licensees to do is to come up with an equivalent,
15 and you get down to specifying what kind of glass you
16 use in a meter face, I mean, it's hard to come up with
17 an equivalent that isn't that piece of glass. So, the
18 detail is really there, and it's really enforced that
19 way. That was part of the TMI action plan, and every
20 licensee, every plant, was to perform a control room
21 design review which included things like lighting,
22 noise levels, groupings of instruments, markings, to
23 the extent that it could be done. Some control rooms
24 were so big and had so many things in it that you
25 could not bring everything to one focal point for the

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1 operator.

2 On the other hand, those were expensive
3 modifications for most licensees, as I recall, and
4 they are - they were and still are very prescriptive.
5 And so, once a prescriptive document like that is
6 published, one needs to really make sure that it
7 represents the latest thinking and the latest science,
8 so to speak, because it will be followed pretty
9 religiously, particularly, in the plants.

10 MR. Persensky: That's why, in fact, CFR 52
11 talks about, you know, it should be the state of the
12 art. This is written to the extent that we can call
13 it state of the art from our perspective.

14 MR. SIEBER: And, the review should be done
15 before construction begins.

16 MR. PERSENSKY: Well, and that's why we
17 have under 0711 that this should follow the process
18 through the design.

19 With the post-TMI, DCRDRs, the reason is
20 you have to go back and retrofit plants that were
21 already built and you had to make changes, and that
22 was more expensive, and that's why we are postulating
23 with 0711 that it be done, particularly for new
24 plants, in the design phase.

25 The EPRI document is really focused on

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1 hybrid control rooms, in that they are saying that
2 whenever you are going to make a change to the plant,
3 to the control room, that it should be done with the
4 same thing, get the human factors in early, don't wait
5 until you build it and then come back and have to
6 retrofit.

7 CHAIRMAN ROSEN: Well, the fact of the
8 matter is that most of the activity in this area is
9 likely to be hybridization of existing control rooms
10 for quite some time.

11 MR. SIEBER: For current licensees.

12 CHAIRMAN ROSEN: Yes, for current
13 licensees. I mean, you know, there will be some new
14 licensees I fully expect, but there will still be 100
15 operating plants out there, all of them moving at some
16 speed to use the digital methods in the control room,
17 and the need will be to properly do those digital
18 changes in a hybrid environment. That's what the
19 revision to 0700 addresses, how one does that, the
20 considerations that need to go into it.

21 MR. SIEBER: Well, considering the pain
22 that licensees went through as a response to the TMI
23 action plan, obviously, the emphasis or the sequence
24 that you are now laying out makes sense. You know,
25 make all the mistakes while they are mistakes on

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1 paper, as opposed to mistakes hardware. So, from that
2 standpoint I think we are headed in the right
3 direction, but as Steve says, there is no doubt that
4 what you will probably see in the near and
5 intermediate term is old analog equipment being
6 replaced with digital equipment, because you can't get
7 the analog equipment anymore, so what we end up with
8 is hybrid equipment which may or may not meet 0700, so
9 there's going to have to be some thought given when
10 the reviews that take place for acceptance.

11 CHAIRMAN ROSEN: I think what you said, and
12 I guess I agree, that looking through 0700 it deals
13 with that subject in the context of an integrated
14 systematic process.

15 MR. SIEBER: Yes, right.

16 MR. LEWIS: Well, if you wanted to save jet
17 fuel and not bring your copy of 0700, the next slide
18 gives you the topics and you can review those.

19 The basic human-system interface elements,
20 information display, interaction and interface
21 management, basic controls. And then the types of
22 systems, like alarm systems, group-view display
23 systems, soft-control systems, computer-based
24 procedure systems, computerized operator support
25 systems and communication systems. And the different

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1 places where these occur, like workstations and
2 workplaces, and then support, like maintainability of
3 digital systems.

4 The changes -

5 CHAIRMAN ROSEN: Why do you use the word
6 soft-control? Is it software control?

7 MR. LEWIS: Yes, it's controls that are
8 mediated by software.

9 CHAIRMAN ROSEN: So, you push a button and
10 that goes to a micro processor.

11 MR. SIEBER: Now you're pushing your mouse.

12 MR. LEWIS: That's right.

13 CHAIRMAN ROSEN: Why - why are you using
14 soft rather than software? Is that just a lingo of
15 the art?

16 MR. PERSENSKY: It's a term of art, claimed
17 primarily for the military and aerospace industries.
18 It's kind of like you talk about glass cockpit as a
19 design for new control rooms, because all the surfaces
20 are going to be glass, in the sense of CRT displays.
21 So, it might be considered jargon, or it might be
22 considered term of art.

23 CHAIRMAN ROSEN: As opposed to hard.

24 MR. PERSENSKY: Right, hard control being
25 switches, the dials.

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1 CHAIRMAN ROSEN: The switch, to the wire,
2 then it goes to an actuator device.

3 MR. PERSENSKY: This could be anything from
4 a mouse, to a touch screen, to a voice actuated
5 control, anything that would drive software to take an
6 action.

7 MR. LEWIS: So, in the next slide we talk
8 about the changes from the prior version. I think
9 I've already mentioned -

10 CHAIRMAN ROSEN: So, let me - I'm now
11 thinking about this, does it deal with wireless
12 control elements?

13 MR. SIEBER: Not specifically, the
14 standards do.

15 CHAIRMAN ROSEN: Well, for example, a
16 wireless mouse could conceivably be used in a control
17 room to, you know, indicate a push button on a screen.

18 MR. PERSENSKY: Right.

19 CHAIRMAN ROSEN: And yet, that interface
20 between the mouse itself and the screen could be
21 interfered with in some way. So, one needs to protect
22 that interface, especially if that click is going to
23 be an important click.

24 MR. PERSENSKY: I'd have to turn it around
25 to see if there was some mention of that.

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1 MR. O'HARA: No, there's nothing. We
2 primarily just dealt - in these documents deal with
3 the human interface, that would be certainly an I&C
4 concern, as part of the review. The control room
5 reviews involve I&C and human factors, and I think
6 that communications protocols that are followed fall
7 under the I&C part of the review.

8 MR. SIEBER: Actually, a dozen or so IEEE
9 standards cover the hardware issues like that one, as
10 opposed to the human factors issues, which are not
11 specifically addressed in the hardware standards. So,
12 you have the hardware standards and reg guides that
13 endorse them.

14 CHAIRMAN ROSEN: Yes, in the I&C standard.

15 MR. SIEBER: Yes, that's how the equipment
16 works.

17 On the other hand, whether you think it's
18 a good idea to operate a plant solely with a mouse,
19 clicking valves on the screen, that is truly a human
20 factors question, and it has a lot to do with what
21 generation you are talking to. The younger generation
22 does everything with a mouse, the older generation
23 does everything with levers and wheels.

24 CHAIRMAN ROSEN: Yeah, tell the younger
25 generation person to pull the lock switch, they

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1 wouldn't know how to use it, too complicated. You
2 actually have to grab it?

3 MR. SIEBER: They couldn't unlock it. They
4 could lock it okay - well it's - we're diverging a
5 little bit.

6 MR. LEWIS: Well, changes from the prior
7 version, mainly it fills in gaps. I mentioned 0700
8 Rev. 1 brought us into the computer age and they
9 identified some gaps when they were doing that, and
10 Rev. 2, to a large extent, fills those gaps. And so,
11 now it contains a general computer-based, human-
12 systems interface review guideline, including soft
13 controls which was mentioned, computer-based
14 procedures and alarm systems, and information
15 management and navigation. These are the topics that
16 there were large discussions on, but I just mentioned
17 interface management, that's an interesting one
18 because when you have a limited number of CRTs, or a
19 limited number of amount of information presented to
20 you at any one time, then you have to navigate through
21 the screens to get to the one you want. And again,
22 maybe the navigation takes too long, that will slow
23 down your progress.

24 So, that was one new item that was added
25 in this revision.

1 MR. SIEBER: Well, one of the factors that
2 was in the original 0700 was with active, you don't
3 want to present more information than you really need
4 to operate the plant in performing this specific
5 operation. That lends itself to the design of what is
6 on the screen, what gets presented to the operator,
7 because too much information is just as bad as none.

8 CHAIRMAN ROSEN: Right, and, of course,
9 that was the ultimate kind of operating experience one
10 got out of the Three Mile Island accident, was the
11 operators were engulfed with information, a lot of it
12 contradictory.

13 MR. SIEBER: They didn't understand it.

14 CHAIRMAN ROSEN: They didn't understand.

15 Now, that's a full-scale prescription for
16 a problem.

17 MR. LEWIS: Now, these are - one of them is
18 a very large document, but, in general, what is the
19 significance of these two documents, 0711 and 0700?

20 First of all, they are the culmination of
21 a large amount of work. We had a number of NUREG/CRS
22 on hybrid control rooms. Joel Kramer, who is in the
23 audience, was in charge of those. There was, for
24 example, a case study on Westinghouse computerized
25 procedures and alarms at - and Bresno that Joel, and

1 John and I and others were involved in.

2 At the end of your packet of vu-graphs,
3 there are about two pages of documents that helped
4 form the technical basis for these two documents, and
5 you'll see it's a very long list.

6 MR. PERSENSKY: And, these are just the
7 documents that we used in terms of what we developed.

8 MR. LEWIS: Yes.

9 MR. PERSENSKY: But, a lot of these
10 guidelines, especially in 0700, come from the military
11 and the aerospace test station.

12 CHAIRMAN ROSEN: Now, you made an
13 interesting comment, James did in his opening remarks,
14 that this document, and I presume the new ones as
15 well, are seeing quite a bit of use?

16 MR. LEWIS: Yes.

17 CHAIRMAN ROSEN: In the military and in
18 other industrial environments beyond nuclear.

19 MR. LEWIS: Yes.

20 CHAIRMAN ROSEN: Which is an interesting
21 comment, because that's where they came from
22 originally. I mean, you said this is not NRC
23 developed insight necessarily, although there's some
24 of that surely, it's a collection of existing works
25 that have been peer reviewed and seem to be

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1 beneficial, which then were excerpted back into the
2 original NUREG-0700, and then when revising NUREG-0700
3 goes back out to the world it now is viewed as a de
4 facto, if you will, guide, which is really its own
5 stuff coming back around the horn, enhanced perhaps,
6 with NRC and NRC contractor insight. Is that kind of
7 how it works?

8 MR. PERSENSKY: It's not quite that way.

9 MR. O'HARA: Yes, it's probably a fair
10 characterization to say that quite a bit of the
11 information in there comes from other sources, but
12 particularly in the recent years, under the program
13 that Paul just mentioned, this hybrid control room
14 project, I think the NRC work, research work,
15 basically, laid the basis for developing some
16 additional guidance, particularly in specific areas
17 like computerized procedures, where there really
18 weren't existing guidance.

19 And, it's a lot of that sort of value-
20 added guidance that we're seeing now popping up
21 elsewhere. There's a recent military standard, for
22 instance, that I was looking at on situation ware and
23 its displays for aircraft, and I'm looking through it
24 and lo and behold I find a lot of our old NUREG/CRS
25 used, the guidance extracted from that.

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1 So, it's been a process, not just of, you
2 know, taking what's out there, but also doing
3 research. We did the Holden study, we did studies
4 with Bresno, and then using insights we learned from
5 that to develop additional guidance.

6 If you look at some of the more recent
7 NUREG/CRs, these technical basis reports, they are
8 developing, in a sense, guidance that characterizes
9 the state of the art, but is not necessarily somewhere
10 else that somebody could go to. So, they are coming
11 to the NRC work to get that.

12 CHAIRMAN ROSEN: Well, I think that sounds
13 entirely appropriate, don't you, I mean that cycle of
14 using other people's work and enhancing with your own
15 insights, and then that being used by the people who
16 originally, whose insights you were using, is a
17 feedback mechanism that has value.

18 MR. O'HARA: Yes, well, in fact, we
19 recently got a letter from ISO asking for permission
20 to use NUREG-0700 as part of a control room standard
21 that's being developed. So, you know, one of the
22 starting places they'll take is the NRC work, and then
23 they'll presumably improve that.

24 So, yes, it's a symbiotic situation.

25 MR. SIEBER: That brings up an interesting

1 question, though, if you look at control room design
2 and available instrument systems, it's likely that the
3 majority of them will be of European design and not
4 fit under the standard QA process, but under the ISO
5 system. And so, you know, and I know this is
6 happening, but there has to be an effort to reconcile
7 what we do in this agency versus what the rest of the
8 world is doing.

9 MR. PERSENSKY: John?

10 MR. O'HARA: John O'Hara again.

11 It's very interesting that there's,
12 particularly in the human factors community, but it's
13 also true in IEC, there's absolutely a small world
14 type of situation.

15 So, there's, you know, I work a lot with
16 IEC, and the commonality between the IEC work now
17 that's being developed and the NRC work is very
18 strong.

19 ISO, as I said, has a lot of - you know,
20 we are all in a sense of using the same basic
21 resources, and each new document tries to advance, you
22 know, what's out there, or make it easier to use, or
23 twist it towards a certain application. But, the
24 world community has certainly shrunk a lot,
25 particularly, in the nuclear industry with the

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1 international vendors, basically, supplying plants
2 here in the U.S., and the modernization programs are
3 heavily - you know, these international vendors that
4 are supplying IEC systems for plant modernization.

5 CHAIRMAN ROSEN: Okay, we've got about
6 maybe 30, 35 minutes left.

7 MR. LEWIS: Okay, we'll go directly to the
8 next part of it.

9 The comments are a good segue to the next
10 slides, which are all on outside uses of the NRC
11 material, and significance to that. There are some
12 outside users from the international community, Korea,
13 Sweden, Spain, the Czech Republic, Taiwan, the U.K.

14 Going quickly to the next slide, outside
15 users of NPP, nuclear power plant designs, EPRI, AECL,
16 Korea, Sweden, Norway, Switzerland, TVA.

17 The next slide are the non-nuclear power
18 plant outsider users, Savannah River, Hanford,
19 Department of Defense, Nick Eckenrode recently used it
20 to review a submarine and aircraft carrier, and it's
21 been used in a number of standards committees as John
22 O'Hara just mentioned.

23 So -

24 CHAIRMAN ROSEN: I hadn't looked at those
25 slides.

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1 MR. LEWIS: Okay, it's a good segue, thank
2 you very much.

3 MR. PERSENSKY: Jim?

4 MR. HIGGINS: If I could just add one
5 amplification on a couple of the questions.

6 MR. PERSENSKY: Give your name, introduce
7 yourself, Jim.

8 MR. HIGGINS: Jim Higgins from Brookhaven
9 Lab.

10 A couple questions came up regarding risk
11 applications associated with NUREG-0711, and just to
12 clarify, the way that's set up, it's actually set up
13 to have the risk information go both ways. That is,
14 the risk insights that you would get - the insights
15 that you would get from the factors part should be
16 factored into the HRA and the PRA, but also it's got
17 guidelines and criteria whereby the risk important
18 human actions that are determined by the HRA and the
19 PRA should be utilized in your function allocation and
20 task analysis, your procedure development and
21 training. So, it's set up to encourage the use both
22 ways of that risk information, not just one way.

23 MR. LEWIS: So, we'll move now to NUREG-
24 1764, what is it? It's - this is guidance for the
25 review of changes to operator actions, and you

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1 mentioned, Chairman Rosen, you mentioned one of the
2 main motivations for the development of this NUREG,
3 and that is, as automated controls have broken down,
4 many times human actions are substituted for them, and
5 because of the large number of submittals like that
6 NRR has had to review changes to human actions.

7 And, in order to systematize that sort of
8 review, that was one of the main motivations for the
9 development of this NUREG.

10 So, it's the guidance for the review of
11 changes to human actions, that includes new actions,
12 modified actions or modified task demands.

13 And, in order to keep up to date we are
14 risk informing this review guidance, and Susan will be
15 talking about the risk screening method in just a
16 moment.

17 This slide will remind you of the place in
18 our group of NUREGs that we are presenting today.
19 NUREG-1764 is an application to modifications to one
20 of the - it's detailed guidance for one of the
21 applications in the SRP, and it draws both human
22 factors review elements from 0711 and, in particular,
23 for the human-system interface review guidance it
24 draws from 0700.

25 NUREG-1764 has three phases. The first is

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1 a risk screening method that Susan will be talking
2 about, that the results of the risk screening method
3 is a determination of which level of human factors
4 review, detailed, moderate or brief, then Jay and I
5 will talk about that. The third phase is the results
6 of the human factors review guidance that will be
7 submitted for integrated decision making.

8 So, I'll turn it over to Susan for the
9 Phase 1.

10 CHAIRMAN ROSEN: Susan, I believe we're
11 ahead of schedule. This is what we were supposed to
12 start after our break, but I commend you and your
13 colleagues for getting us ahead of schedule.

14 Go right ahead now.

15 MS. COOPER: I'm afraid I haven't done
16 anything about getting you ahead of schedule, it's my
17 colleagues.

18 CHAIRMAN ROSEN: Well then, you'll get -
19 help us get back on schedule.

20 MS. COOPER: I'll try to keep it on
21 schedule.

22 MR. SIEBER: You should take credit, too.

23 MS. COOPER: All right, thank you.

24 CHAIRMAN ROSEN: Apparently, there are a
25 few and far between chances to take credit for

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1 something.

2 MS. COOPER: All right.

3 Yes, my name is Susan Cooper. I'm in the
4 Office of Research in the Probabilistic Risk Analysis
5 Branch.

6 I think it would be appropriate just to
7 say a few words about how I got involved. The PRAB
8 branch and the Office of Research has had a role in
9 this project, I think from its beginning, those who
10 have been with this project from the start can correct
11 me on that, and there have been a variety of people
12 that have been in the review mode, in the PRAB branch.

13 And, I continued in that review mode, and
14 that eventually evolved into me being more involved in
15 the development of this risk screening process. But,
16 I want to, once again, call attention to some of the
17 members of our audience, because while I'm speaking
18 right here there was a very large role played by
19 Brookhaven. They did the initial work and it was a
20 collaborative effort all the way to the end, and then
21 Gareth Parry I very much relied on his input and his
22 concerns in the development of the risk screening
23 approach. So, I just wanted to make sure that was
24 clear.

25 There are four steps in the risk screening

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1 approach for NUREG-1764. The first three are the
2 development of inputs to be used then in the final
3 step, which integrates the results of those three
4 inputs.

5 The first step is to evaluate the change
6 in risk due to a modification. This is using the
7 existing reg guide, 1.174, and using the results of
8 the application of that reg guide, which places a
9 change request into different regions. And, I'll get
10 into a little more detail about that in another slide
11 or two.

12 The second step then evaluates the risk
13 significance of the human action, in particular,
14 focusing in on the human action.

15 The third input then is a qualitative
16 evaluation, and then as I said before, the fourth step
17 then is to take all three of these inputs and try to
18 come to an integrated decision on what level of effort
19 should be put into human factors review for this
20 particular approach.

21 The guiding principles on the development
22 of this approach are on one hand the folks at NRR
23 wanting to have an approach that does provide
24 screening. In other words, they don't want to spend
25 the same amount of review effort for every request

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1 that comes to them. On the other hand, we do want to
2 make sure that the appropriate level of effort is
3 given to certain requests, and there are a number of
4 different factors to take into consideration, not just
5 the risk information, but also giving the proper
6 emphasis to qualitative inputs if the risk information
7 is not the complete answer.

8 I guess the other thing I should say, and
9 it's not discussed here, is that there is a fallback
10 approach. If there isn't risk information, there is
11 a generic approach for trying to develop a risk-based
12 ranking so that the graded approach for human factors
13 review can still be done.

14 CHAIRMAN ROSEN: So, a licensee who doesn't
15 have a PRA or one that's up to date that covers the
16 action that he's attempting to get relief on can still
17 come in and try to convince the staff that this seems
18 like a good idea, what the heck, you know, let's give
19 it a shot, and we don't have any basis for it other
20 than our own intuition, so please approve it?

21 MS. COOPER: You know, you might have
22 crossed this a little bit over the line. In general,
23 there is - I think there's always a provision that a
24 licensee can come in with a non-risk-informed
25 approach, and as a matter of fact Gareth can probably

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1 answer this question better, Chapter 19, which
2 addresses the Peer A review, states that they can do
3 that.

4 Now, there are certain kinds, there was a
5 number of criteria that, again, is in Chapter 19, that
6 says when the staff can come back and say, well, maybe
7 this is not appropriate. And, we've tried to
8 incorporate some of those ideas in here as well and
9 reference back to Chapter 19.

10 CHAIRMAN ROSEN: Staff could just to that
11 no, what part of no are having trouble understanding.
12 You know, if you want to make that change,
13 recategorize it to Level I, it's likely to be very
14 risk significant, we don't have a risk analysis so we
15 go back and live with what you have, kind of said
16 nicer than that, but that's what ends up being at the
17 end of the day.

18 MS. COOPER: Okay, like I said -

19 CHAIRMAN ROSEN: Well, that's the way we
20 would like it, us rationalists at ACRS would like it
21 to come out that way.

22 MS. COOPER: - well, like I said -

23 MR. POWERS: You don't need to give a
24 special credence to the rationalist point of view.

25 CHAIRMAN ROSEN: Let's point out that I

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1 have the hammer here today. If Dana wants it back
2 he's got to take the committee back. He was my
3 predecessor, my August predecessor, in this role, and
4 so I've learned everything I know about this subject
5 from him.

6 MS. COOPER: What I will say is that what
7 we have in NUREG-1764, with respect to the risk
8 screening, is consistent with and refers to Chapter
9 19, that is the basis for, you know, the staff review
10 of risk-informed applications, and also what's in reg
11 guide 1.174. So, there's a lot of interplay with that
12 chapter, as well as, you know, with Chapter 18.

13 So, you know, whatever guidance there is
14 so far as what a licensee is allowed to do, so far as
15 a non-risk-informed application, we also must address,
16 because that provision is given in Reg Guide 1.174 and
17 Chapter 19. So, we this has to be addressed -

18 CHAIRMAN ROSEN: Yes, I know, I know all
19 about that, and there's at least a raucous majority or
20 raucous minority, I'm not sure, but raucous for sure,
21 that thinks that changes that have risk significance
22 ought to be evaluated on a quantitative basis for the
23 risk analysis.

24 That's just Chairman Rosen and maybe some
25 of his friends think that way, not all of them.

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1 MS. COOPER: I won't disagree, I'm -

2 MR. POWERS: That presumes that you have
3 friends.

4 MS. COOPER: - just saying, because of the
5 way it is we've had to structure this document to fill
6 that gap, should that come up, because that's the fact
7 of life in the NRC regulations.

8 CHAIRMAN ROSEN: I'm aware of that.

9 MS. COOPER: So, it must be that way.

10 CHAIRMAN ROSEN: But, on this side of the
11 table we get to rail about the facts of life. You
12 have to live with it, we get to rail about it.

13 MR. POWERS: I mean, you have four very
14 plausible steps for a screening methodology. A
15 screening methodology is to put things in or out of
16 further analysis, is that correct?

17 MS. COOPER: Yes.

18 MR. POWERS: And so, the only danger you
19 really face in using this methodology is you say
20 something is not meritorious of further analysis when,
21 in fact, it is.

22 MS. COOPER: It's not even quite that bad.
23 It's, basically, that something that you, perhaps,
24 might have reviewed in more detail you did not, but
25 even then once you got into a review you might

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1 recognize that that's the case.

2 MR. LEWIS: Yes, the product is a level of
3 review, it can be a detailed review, or moderate
4 review or a brief review. 'It's not review or not
5 review.

6 MR. POWERS: Yes, I understand, I mean,
7 it's just - it's the detail, and the only danger you
8 run is that you didn't do detailed or enough, a new,
9 inexperienced of a person doing the review or
10 something, not enough eyeballs looked at it. That's
11 really the only danger that you have here.

12 MS. COOPER: That's correct.

13 MR. POWERS: How do you know that this
14 method works?

15 MS. COOPER: Has it been tested?

16 MR. POWERS: Yes.

17 MS. COOPER: No, not that I'm aware of.

18 MR. POWERS: How would you go about testing
19 it?

20 MR. PERSENSKY: Actually, we have done some
21 paper and pencil testing of it, or BNL did in terms of
22 looking at approaches to how you do that with some
23 examples that had come in. So, it's not - it hasn't
24 been tested in the sense of forward looking, but in a
25 backward looking way.

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1 MR. POWERS: Well, that's the only thing
2 you can do, is go back and look at things and see how
3 they would have come out had you had this methodology
4 before. I mean, it has to be an a priori kind of an
5 examination.

6 And so, you've done that. Were they all
7 gimmees, were there any -

8 MR. PERSENSKY: Jim has the final count on
9 those, Jim Higgins from BNL did those tests for us.

10 MR. HIGGINS: Yes, Jim Higgins.

11 The methodology has gone through several
12 iterations, so I just need to maybe preface it with
13 that, because we have done a variety of tests over the
14 years on the different iterations that that
15 methodology has gone through.

16 And, I guess about three years ago it
17 started out, we had the first draft of the method
18 which was published in NUREG/CR-6689, and for that
19 method, which is quite similar to this, but there are
20 some modifications, but back then we looked at all of
21 the changes to operator actions that had been
22 submitted to the NRC which we got from Jim Bongarra
23 and Dick Eckenrode and his people. And, they covered
24 a period of about five or six years, and, Jim, the
25 number was about 21, is that right? About 20 items

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1 that had been submitted to NRC for review over those
2 times.

3 And, interesting about this discussion on
4 risk-informed very non-risk-informed, every one of
5 those was submitted as a non-risk-informed change
6 request.

7 MR. POWERS: That's not surprising.

8 MR. HIGGINS: And so, what we did is we
9 tried to look at if those had been submitted, if the
10 guidance here was applied to them, what level would
11 they have fallen into in terms of level of review, the
12 three, the one, two and three levels of review. And,
13 we did put out a report on that, and again just kind
14 of trying to remember, basically, my recollection was
15 that there were four that would have fallen into the
16 level one, highest level review. There were a couple
17 that was in the medium level of review, but the
18 majority, about 12 or 13 of them, actually were in the
19 lowest level of review, which were items that were
20 really not risk significant.

21 Now, the NRC, when they reviewed those,
22 they reviewed the same standard set of criteria.
23 There wasn't any grading. They had a set of criteria
24 that they used which, primarily, came out of an old
25 information notice from the early to mid '90s, and

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1 they were reviewed to a consistent set of criteria
2 with a consistent level of effort.

3 So, this methodology, if it were applied,
4 would apply to more detailed reviews to a small subset
5 of those, and then much briefer reviews to other ones.

6 Then - right, to the majority of those -
7 then the methodology was upgraded and modified based
8 on comments in about late 2001, was issued as a draft
9 for comment NUREG-1764, and additional tests were done
10 on that based on looking at human actions from - first
11 we did it, we selected five ITEs, and we got all of
12 the human actions that were in those ITEs. We got the
13 RAW values and so forth, and we utilized those to
14 place these into the different risk regions to see
15 where they would fall. And, in fact, that was the
16 same order of magnitude, maybe about 30 or so human
17 actions, and we utilized that to see if changes -
18 these were not actual change requests, but we said,
19 given all of the risk important actions in all of
20 these ITEs, what levels would they fall into?

21 And we utilized that to try to see if the
22 levels and the criteria that we had established to
23 parsing these out into the different regions, gave us
24 a reasonable distribution, were they all falling into
25 region one, were they all falling into region three,

1 were we getting a reasonable distribution.

2 And, it seemed like they were, but we
3 actually used that information to tweak a little bit
4 on the splits between the regions or the thresholds
5 that would place them in one region versus the other.

6 And then finally, as we got into the last
7 version of 1764, before it reached the version it's at
8 now, we used information from another five PRAs that
9 were current, updated PRAs after the ITE, and we
10 utilized ones that had both RAW and Fussel-Vessly,
11 because that enters into the methodology now, and we
12 gained this information as part of the SDP bench
13 marking program, part of the reactor oversight
14 program.

15 When we made plant visits, and we
16 collected all this human error and human action
17 information and all of the importance measures, and we
18 performed again similar sort of activities on
19 distribution and thresholds and so forth.

20 So, that's about where we are. Since the
21 latest revision and modification of this was completed
22 in the summer, which is not too different, but is a
23 little bit different than the earlier version, it has
24 not been retested in its final incarnation and there
25 is some plans to do that when we do the final

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1 technical basis document, when it does get finalized.

2 Sorry if that was a little long winded,

3 but -

4 MR. POWERS: It's very valuable, it,
5 unfortunately, tells me I have some homework to do
6 that I wasn't really looking for, because it sounds
7 like you have some interesting reports.

8 One area that I ask you a question about,
9 though, is that you said you compared the human
10 actions in the ITE, and you said, gee, is it a
11 reasonable distribution, and Doctor Kress will tell
12 you that I'm a very unreasonable person, but I'm
13 wondering what a reasonable distribution is? To me,
14 it seems to me that if I found a human action
15 considered in an ITE I would be surprised if any one
16 of those actions fell in your lowest category.

17 Now, is that -

18 MS. COOPER: The current process wouldn't
19 rely on that kind of information.

20 CHAIRMAN ROSEN: It would not?

21 MR. POWERS: No, I'm asking about his
22 testing.

23 MS. COOPER: Testing, well -

24 MR. POWERS: He tells me -

25 MS. COOPER: - yes, but all I was saying

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1 is that the current version of the process doesn't
2 have that reflection. As a matter of fact what I'll
3 say is that my contribution in this has not only been
4 to adjust some of the logic, but also to maybe make
5 the process a little bit more conservative,
6 principally because I saw, well, two gaps.

7 One, manual actions that are being
8 introduced in change requests to replace previously
9 automatic actions performed by hardware, therefore,
10 that action was never modeled in a PRA before and you
11 can't find another PRA that's ever modeled it before.

12 So, the information that you might have
13 from a PRA model, including any that you have on hand
14 or people have submitted, is of limited, if any - of
15 any use, you know, direct use, so far as determining
16 an importance measure.

17 CHAIRMAN ROSEN: From other models, right?

18 MS. COOPER: Right.

19 CHAIRMAN ROSEN: But, if someone has
20 introducing a new manual action into their PRA, and
21 have done their own PRA, one could easily -

22 MS. COOPER: Yes, if they've done their
23 own. If they have not -

24 CHAIRMAN ROSEN: - find the value, the RAW
25 value for that and the Fussel-Vessly value for that.

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1 MS. COOPER: - if they have done their PRA
2 that's correct, but on the generic method side, in
3 other words if it's a non-risk-informed submittal, you
4 can't go to a generic source, and so there was a
5 little bit of beefing up there that I did on that
6 particular logic.

7 CHAIRMAN ROSEN: Right.

8 MS. COOPER: And, in general, just to make
9 some of the other adjustments, or just more toward the
10 conservative side, so far as where the reviews would
11 go.

12 CHAIRMAN ROSEN: This may be a good chance
13 to introduce my concern here. The idea that one could
14 take a non-risk-informed submittal is the far pole of
15 the spectrum of my concern. Some place back away from
16 that is using the risk-informed submittal, having the
17 risk-informed submittal, but one that doesn't cover
18 low power and shutdown modes. In other words, one has
19 to enter Reg Guide 1.174 and pick out a CDF, but you
20 don't know what the CDF is, you only know the part of
21 the CDF, the CDF that relates to internal events. You
22 don't have the other, the rest of it, and we know from
23 experience that that CDF can go from being - the low
24 power and shutdown CDF can go from being 10 percent of
25 the internal event CDF to being twice it. So, we just

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1 don't know where the current one is if the applicant,
2 who has a risk-informed change, doesn't have a full
3 scope PRA, in a sense of covering all operational
4 modes, how do you deal with that?

5 MS. COOPER: Well, there are two answers to
6 that. First of all, this document does not create
7 anything, great new approaches or ideas for how anyone
8 in NRR and the PRA branch would review something like
9 that. That problem has been left over on their side
10 in Chapter 19.

11 CHAIRMAN ROSEN: It's left to a student as
12 an exercise.

13 MS. COOPER: No, it's not, it's just
14 recognition, it's recognition of whose problem is
15 that?

16 CHAIRMAN ROSEN: Yes.

17 MS. COOPER: It's not the human factors
18 person's problem.

19 Now, we do - this document does have, you
20 know, PRA and human factors are meeting in the sense
21 that we are trying to use PRA to help out the human
22 factors folks and reduce their workload, but it is not
23 the intention of this particular document to make
24 great strides in solving the problems of the PRA folks
25 over in NRR and what they do.

1 CHAIRMAN ROSEN: Well, we can invite the
2 PRA folks, though, because -

3 MS. COOPER: Well, maybe we should let
4 Gareth think about that.

5 CHAIRMAN ROSEN: - we have previously
6 commented on the nature and causes of that kind of
7 potential non-conservatism, in particular, in our ACRS
8 letter to Chairman Meserve on Chapter 19 of the
9 Standard Review Plan and Regulatory Guide 1.174, on
10 July 23, 2002. We commented in particular about the
11 lack of full scope PRAs and the use thereof of non-
12 full-scope PRAs and regulatory processes.

13 And here, jump up out of the woodwork is
14 the clearest example of it that I know of. There are
15 others.

16 MS. COOPER: Well, I'll say two things.

17 We did - we are trying to - we are filling
18 some small gap in Reg Guide 1.174 by addressing human
19 access specifically, but we are not addressing any of
20 the other problems.

21 And, with that, I'm going to let -
22 recognize Gareth Parry back there from NRR to respond.

23 MR. PARRY: Yes, this is Gareth Parry.

24 I think you, perhaps, really ought to read
25 Reg Guide 1.174 again, because, actually, if you look

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1 at region 3 of the acceptance guidelines, it doesn't
2 ask you to calculate the total CDF. What it asks you
3 to do is to make sure that you don't have any reason
4 to suspect that you are way off on the right-hand
5 side. That's particularly for very small changes and
6 risk.

7 So, you really ought to reread that again,
8 because we recognize the fact that people don't have
9 full-scope PRAs, and that got factored into the way
10 those acceptance guidelines were written.

11 But, I think, in a sense, this is getting
12 way off the mark of what Susan really is trying to
13 tell you about today, but I just thought I felt that
14 I had to at least put that comment in on the record
15 here.

16 CHAIRMAN ROSEN: And, Gareth, you can tell
17 me to reread it, and I will, because you asked me to.

18 MR. PARRY: Good.

19 CHAIRMAN ROSEN: It's a painful thing to
20 have to do, because -

21 MS. COOPER: It's short.

22 CHAIRMAN ROSEN: - yes, it's not because
23 it's short, it's short, but painful, it's because,
24 yes, you say you should consider all the other sources
25 of risk, other than the internal events risk, but in

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1 the sense of trying to be a decision maker, and I've
2 got this darn chart staring me in the face, and I've
3 got to find a place on the X axis on where to enter
4 it.

5 MR. PARRY: You really -

6 CHAIRMAN ROSEN: And, I don't know where to
7 enter it.

8 MR. PARRY: No, and in some senses the
9 guidelines are written so that you don't necessarily
10 need to know that to a great deal of detail.

11 But, I think this - well, this is really
12 getting off the mark, though.

13 CHAIRMAN ROSEN: Only in the sense that
14 this is an application in that problem, really.

15 MR. PARRY: Yes.

16 CHAIRMAN ROSEN: It's one place where it
17 shows up, and very clearly.

18 MR. PARRY: And, the reason -

19 CHAIRMAN ROSEN: And, it's one that has
20 high regulatory significance and interest in the
21 public, the manual actions.

22 MR. PARRY: - yes, but I think, again,
23 again, I think the way the regulatory guide was
24 written was in recognition of the fact that the
25 industry does not have full-scope PRAs for most of the

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1 plants.

2 We want to encourage the use of risk
3 information to make rational decisions, and recognize
4 the limitations of the risk input, which is why we say
5 you have to consider the other modes.

6 And, the argument has to be relatively
7 convincing, but it still has to be considered.

8 Now, the sort of things that we're talking
9 about here might be the replacement of an automatic
10 initiation by a manual for a short period of time, it
11 should only be in one mode of operation at the plant,
12 for example. So, you wouldn't have to worry about the
13 shutdown if you were in full power, for example,
14 because it's only in that limited -

15 CHAIRMAN ROSEN: Well, actually, we're
16 talking about fire here I think.

17 MR. PARRY: I'm not sure, actually.

18 CHAIRMAN ROSEN: Well, I'm talking about
19 fire.

20 MR. PARRY: Okay.

21 CHAIRMAN ROSEN: I'm talking about - I'm
22 also, by the way, Chairman of the Fire Protection
23 Section, I'm talking about fire when I'm sitting here
24 now, and I'm thinking about a fire in a plant that's
25 operating full power, that transitions below power as

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1 a result of the fire, which is one of the things it
2 usually does.

3 And, someone previously said, oh, don't
4 worry about this, it's true we don't have good
5 separation in this area, but we have a manual action
6 to take into account, where we can send someone to
7 change the position of a valve or something like that,
8 and here's our analysis that shows that that's
9 completely feasible under the circumstances.

10 And, to me, that's at the very heart of
11 this question.

12 MR. PARRY: That's feasibility, though, and
13 isn't that the subject of another - of another manual
14 actions project, right? That's not specifically, I
15 don't think, a function of this one, but you guys
16 would know better than I.

17 MS. COOPER: Yes, there is another
18 approach.

19 MR. PARRY: There's another -

20 CHAIRMAN ROSEN: There's another place I
21 can go to see that other than here.

22 MR. PARRY: Yes.

23 MR. LEWIS: Different group of people.

24 MR. PARRY: Different group of people, yes.

25 MR. KRESS: I'm also concerned about the Y

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1 axis, the delta CDF.

2 MR. PARRY: Yes.

3 MR. KRESS: I envision you, let's take -
4 you are going to change an automatic action to a
5 manual, the automatic action has some probability of
6 not occurring, which is in the PRA, it gives you its
7 contribution to the CDF.

8 The manual action has got some sort of
9 human factors failure of the action being carried out
10 that goes into it and gives you a new CDF.

11 Now, that human factors correlation we've
12 observed has a lot of uncertainty in it, and 1.174
13 asks you to account for uncertainties, and one way to
14 do that, in my mind, would be to use a RAW and a
15 Fussel-Vessly together to get the range of
16 possibilities of that action being performed properly
17 or not being performed properly.

18 Now, the question I have is, is that where
19 you are using the importance measures.

20 MS. COOPER: We are using -

21 MR. PARRY: Yes.

22 MS. COOPER: - we are using the importance
23 measures in the second step of the process as the
24 second input. The first input being from Reg Guide
25 1.174, what region assignment has the overall request

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1 change been put in, the second input then being, as
2 you said, the RAW and the Fussel-Vessly importance
3 measures for that human action, it's focusing in on
4 the human action.

5 MR. KRESS: So, it gives you an idea of the
6 change.

7 MS. COOPER: Right, so that also gives a
8 first initial assignment as to where, you know, what
9 level of review should be required. Then the second
10 screen or criteria, if you will, is in a qualitative
11 evaluation. So, you can see there are certain layers
12 of robustness that are built in here. You've got kind
13 of the rough scoping of how important is this overall
14 change, then the action specifically, how important is
15 it, and then, you know, qualitative information, are
16 there other things that might be important that may
17 not be reflected in either the PRA result or the
18 specific HRA, importance results that I need to factor
19 in. Then those are integrated into a final answer,
20 and as was pointed out, really, the only negative
21 consequence that we can imagine here is that maybe you
22 haven't given as much detailed review as you might
23 have if you get the wrong assignment, and that sort of
24 thing might well come out in the course of your
25 review, and you can make your adjustment. It's not

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1 set in stone.

2 MR. PARRY: I think I'd like to add -

3 MR. KRESS: The second question, part of
4 this question is -

5 MR. PARRY: - okay.

6 MR. KRESS: - how actually do you use a
7 RAW and FV to get an uncertainty distribution,
8 uncertainty range, not a distribution.

9 MR. PARRY: I don't think - they are not
10 used to generate uncertainty distributions, but I
11 think the same cautions about using importance
12 measures that are in Reg Guide 1.174 in Appendix A are
13 included in this document by reference. So, I think
14 you are asked to do various sensitivity studies, as a
15 means of getting at the ranges.

16 MR. KRESS: Sensitivity.

17 MR. PARRY: Yes, but then you choose the
18 most conservative of the assessments of RAW or Fussel-
19 Vessly, and it's not just on the HEPs and to her
20 things.

21 MR. KRESS: But, we could view a RAW, for
22 example, in sensitivity.

23 MR. PARRY: Yes, you could do that, but I
24 think since RAW is the parameter that we are looking
25 at, what we have to do is to look at the uncertainty

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1 in RAW, due to other uncertainties in the model.

2 CHAIRMAN ROSEN: And also, when you get the
3 RAW you have to use it sensibly. You have to say, if
4 it's close to your threshold, and the wrong side of
5 your threshold, you'd be putting that particular
6 action in the low category, because a simple model
7 update, which is something you do every 18 months in
8 a plant, could change that RAW from being below the
9 threshold to being above the threshold. And so, this
10 is an operational concern to independent review
11 panels, that they take note of where these RAWs are
12 when they are making decisions. A RAW of 1.95 is a
13 RAW that probably ought to be in the higher category,
14 rather than in the thresholds 2, you are at 1.95, you
15 ought to probably put it in the next higher category
16 rather than leave it in the lower category.

17 MS. COOPER: All I'll say is that in the
18 process that we're using we are not - there aren't
19 what I call bright lines so much, because we recognize
20 that there might be more than one outcome. And so,
21 there is room for qualitative judgment.

22 CHAIRMAN ROSEN: Well, I promise, Susan, to
23 let you actually get into the process here at some
24 point, you haven't even begun.

25 MS. COOPER: That's right.

1 CHAIRMAN ROSEN: But, you provoked pretty
2 much all of the -

3 MS. COOPER: Yes, I think we've covered a
4 good deal of the slides already, at least by
5 implication.

6 Would you like me to try to go ahead and
7 do some of them explicitly?

8 CHAIRMAN ROSEN: Go ahead, you've got at
9 least three more minutes. Yes.

10 MS. COOPER: I have three more minutes, is
11 that what you say?

12 CHAIRMAN ROSEN: Until the break.

13 MS. COOPER: Okay, all right.

14 I believe I've gone through the four steps
15 of the process, and I'll then go quickly through the
16 steps. As I said, we've covered some of these
17 already.

18 The first step is using Reg Guide 1.174,
19 where analysts in that reg guide are told to evaluate
20 the change in risk for a modification. The delta CDF,
21 and then place the requests into a Region I, Region
22 II, Region III category. And, there really isn't
23 anything for this particular document, NUREG-1764, to
24 do, except to take that input into the overall process
25 for making decisions.

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1 I should say CDF and LERF.

2 And, according to our current screening
3 method, if the change requests only involves human
4 action, and there's a Region I assignment, there's a
5 shortcut so far as the overall process.

6 CHAIRMAN ROSEN: You have the 36 and 37
7 slides, these are reproduced right out of 1.174.

8 MS. COOPER: Doing a Level I review.

9 CHAIRMAN ROSEN: This one here.

10 MR. PERSENSKY: Yes, those come directly
11 out of 1.174.

12 MS. COOPER: Right, those are right out of
13 1.174.

14 And, if it's not Region I and a human
15 action only, then you need to go on to the second
16 step, second input to the overall process, and this
17 particular step then, the risk significance of the
18 human action is determined using risk importance
19 measures, RAW and Fussel-Vessly importance measures,
20 and the results of these calculations then makes a
21 preliminary determination of the review level, which
22 is going to be used along with the results of the
23 first and third step.

24 The third step is a qualitative
25 evaluation. It allows the reviewer to either reduce or

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1 elevate the level of review, based on a series of
2 questions addressing factors such as personnel
3 functions and tasks, design support for task
4 performance, and performance shaping factors.

5 CHAIRMAN ROSEN: Is this the place where
6 the reviewer could elevate based on it being too close
7 to the threshold? Like this 1.95.

8 MS. COOPER: He could here, yes, if you
9 like, but I mean, like I said, even at other places in
10 the process it isn't like there's - this is the
11 result, and it is Level I, it's usually Level I, Level
12 II, there's some margin of error. And so, the
13 judgment can be applied there also, as well as in the
14 final step then, step 4, which is the integrated
15 assessment, and there's a table in the document that
16 I think shows you the logic path of how you put
17 together the inputs from the three different steps and
18 then come up with a final recommendation for the level
19 of human factors review.

20 CHAIRMAN ROSEN: All right.

21 MS. COOPER: SO, I think I made up some
22 time.

23 CHAIRMAN ROSEN: Yes, you did well.

24 MS. COOPER: But, do you have any
25 questions?

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1 CHAIRMAN ROSEN: Anymore questions.

2 I guess what we'll do when we come back is
3 talk about the human factors review itself for the
4 rest of the afternoon. So, with that -

5 MR. LEWIS: If you don't have any
6 questions, there is one loose string.

7 Chairman Rosen, I think you had some,
8 somewhat facetiously, that the non-risk-informed
9 submittal you put it a Level I review, and I don't
10 think that was answered.

11 MS. COOPER: Oh, I didn't hear that.

12 MR. LEWIS: Yes.

13 MS. COOPER: I didn't hear him say that.

14 MR. LEWIS: I think I'd like to put on the
15 record that that isn't the case. We do have a
16 procedure for non-risk-informed submittals.

17 MS. COOPER: Yes.

18 MR. LEWIS: A number of pages on it, and if
19 you look at Tables 2.3 and 2.4, with the non-risk-
20 informed submittal, the level of review can be I, II
21 or III.

22 CHAIRMAN ROSEN: I'm with Susan on that
23 one, I don't remember saying that either, but, you
24 know, the transcript will tell.

25 It would be my presumption for a non-risk-

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1 informed submittal to just tell them to - if it's an
2 action that I think intuitively has some risk
3 involved, to just come back with a risk analysis, or,
4 you know, we'll give it a Level I review, and that's
5 the choice.

6 But, that's why I'm on this side of the
7 table and not on that side.

8 We'll now take a break until 2:50. No,
9 wait a minute, it is 2:50, we should have broke - yes,
10 until 3:05.

11 (Whereupon, at 2:53 p.m., a recess until
12 3:10 p.m.)

13 CHAIRMAN ROSEN: Phase 2, human factors
14 review, right?

15 MR. LEWIS: Yes.

16 So, in the first phase the risk-informed
17 screening process determines the level of human
18 factors review, and as we see on slide 43 there are
19 three levels, and the first one is most detailed, and
20 the review areas are taken mostly from NUREG-0711,
21 another tie in that makes all four of these documents
22 kind of a whole. Level II is a moderately detailed
23 review, and Level III is a brief review.

24 MR. SIEBER: And, it's too bad those
25 numbers aren't reversed.

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1 MR. LEWIS: Yes, that causes a problem.

2 MR. SIEBER: With III going to the levels
3 of PRAs.

4 CHAIRMAN ROSEN: Level III is a brief
5 review.

6 MR. LEWIS: Well, they do agree with 1.174.

7 CHAIRMAN ROSEN: Yes.

8 Is Level III so brief as no review?

9 MR. LEWIS: No.

10 Well, Jim, do you want to address that?

11 MR. BONGARRA: For Level III, we're really
12 kind of leaving that up to some degree to the
13 discretion of the reviewer.

14 I would hesitate to say that we don't do
15 any review. We would do a verification type review to
16 make certain that the submittal is really a warranting
17 Level III, a low risk significance, if you will,
18 without having the risk numbers necessarily.

19 So, it would be a cursory sort of
20 verification type of a review that we would do, and,
21 perhaps, you know, we might discover something that,
22 again, we may have missed in an earlier, you know,
23 process, or earlier part of the process I should say.

24 MR. SIEBER: Is that a risk review or a
25 practicality review, or deterministic?

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1 MR. BONGARRA: It's a deterministic review
2 that we would do.

3 CHAIRMAN ROSEN: Do you have examples of
4 these kinds of things that would help me - just to
5 make it a little more tangible, what human action
6 might be that's in a Level III, or Level II, or a
7 Level I? It would seem to me a little bit more
8 tangible if you had some examples.

9 MR. BONGARRA: Jim, are you recalling
10 something?

11 MR. HIGGINS: I guess if you look at from
12 a particularly risk standpoint, and the ones that
13 would fall into that, generally, these were ones, if
14 you look at the PRAs and the ITEs you'll see a lot of
15 human actions that have RAW values down at the -
16 basically, they round to 1.0. And, there's quite a few
17 of those in a couple PRAs.

18 CHAIRMAN ROSEN: And, typical, what that
19 means is that then they - it had to be first a model
20 human action.

21 MR. HIGGINS: That's right.

22 CHAIRMAN ROSEN: But, in the circumstances
23 we are talking about, the CDF didn't change at all.

24 MR. HIGGINS: Right, and also, it has a
25 very small Fussel-Vessly value also, down to like

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1 .0001 or something like that. And, those are the kind
2 of actions that typically - and as a result, they
3 would also not contribute anything to the delta CDF.

4 CHAIRMAN ROSEN: Right, and those are the
5 kind of actions PRA analysts say, why did we bother to
6 model this thing.

7 MR. HIGGINS: Right, so those would be the
8 kind of group of actions that would end up being Level
9 III here, and these would also get, after you did that
10 and you saw you had these handful of actions that were
11 of that type, it would go through that Step 3, which
12 is a qualitative review, to see that it's not an
13 action such as, say, Susan and Gareth were talking
14 about, that had been previously automated and now it's
15 manual, and that's why it doesn't appear in the PRA,
16 or those sorts of things. There's nothing from a
17 human factors standpoint that makes it really stand
18 out as being potentially important.

19 And then, it would be, as Jim said, Level
20 III, so you'd verify from your risk numbers that, in
21 fact, it is in Level III.

22 Also, the guidance in here says that if
23 there are - if you have some concerns you could pick
24 out pieces of the Level I or the Level II review and
25 say, I want to verify, just at the minimum, that it's

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1 in the training program and it's covered in the
2 procedures. Maybe you want to just do that.

3 Right, Jim, and it might be limited to
4 that.

5 MR. BONGARRA: I think, too, that if, for
6 example, there are actions that we know are not
7 associated with safety-related systems, for example,
8 or that have, essentially, no impact on a safety-
9 related system, then those actions could very well be
10 in that Level III review category.

11 CHAIRMAN ROSEN: I'd be more comfortable if
12 you hadn't mentioned the things you just mentioned.
13 You know why? It's because the whole idea of safety-
14 related systems was a surrogate to not having the risk
15 analysis in the first place. It was what do we think
16 is going to be important in this plant, we will make
17 them safety-related, we'll make the whole system
18 safety related and build it that way, on the
19 presumption that we didn't have a risk analysis.

20 Well, we have risk analysis, and so when
21 we say, well, it's safety related or not safety
22 related, we could be falling back into that trap, that
23 somebody originally didn't find something that was, in
24 fact, risk significant, so they called it not safety
25 related, and now we are just relying on that old

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1 incorrect model because I know for a fact that one
2 plant we found a bunch of stuff that was not safety
3 related that was risk significant.

4 So, just take that for a caution if you
5 will.

6 Not 99 percent of it was, you know, I'm
7 saying 1 percent of the things we called -

8 MR. SIEBER: Not safety related.

9 CHAIRMAN ROSEN: - not safety related
10 turned out to be risk significant.

11 MR. BONGARRA: Well, I also think, in sort
12 of hopefully a defense here of what I just stumbled
13 over, perhaps, you know, as Susan indicated earlier,
14 that in the case where there are actions that have not
15 been identified previously from risk assessments, and
16 there aren't actions that are easily identifiable, and
17 Paul will probably get into this in more detail with
18 regard to the generic tables that we have in the
19 document, then we are, or we would look at those with
20 a more conservative assessment, regardless of -

21 CHAIRMAN ROSEN: I know what you meant,
22 James, I just caution that that is a trap.

23 MR. BONGARRA: It's a trap.

24 CHAIRMAN ROSEN: It's a trap you can get
25 into and really relies on thinking that's now 30 years

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1 old, most of which was right, by the way, but there
2 are cases where it's not right.

3 Anyway - I interrupted your presentation
4 by asking for some tangible examples of these things.

5 MR. LEWIS: No, that's fine, so those are
6 the three levels of review, and if we'd go to slide
7 44, one of the motivations for developing this NUREG
8 was NRR had review guidance scattered in a variety of
9 different documents, as it exists, but it was several
10 different documents.

11 And so, one of the purposes of developing
12 this NUREG was to bring all that guidance into one
13 document and consolidate it. And so, some of the
14 previous guidance that existed was Information Notice
15 9778, and the title pretty much tells what that does,
16 "Crediting Operator Actions In Place of Automatic
17 Actions and Modifications of Operator Actions,
18 Including Response Times." It listed a number of
19 qualitative questions to ask, or issues to look into,
20 and there's similar issues that were dealt with in
21 Notice 9118.

22 And, a lot of the issues were dealt with
23 in the previous versions of 0711, so a lot of this
24 guidance this exist previously.

25 So, if we'll move on to the third phase,

1 after the human factors group has made their review,
2 they make their decision, and then according to Reg
3 Guide 1.174 they submit their decision to integrated
4 decision making in the Safety Analysis Report, and
5 that's the end of our discussion of NUREG-1764.

6 Do you have any questions on that?

7 If not, we'll go into the summary of our
8 entire presentation. Jim?

9 MR. BONGARRA: Well, as we've covered this
10 afternoon, SRP Chapter 18, once again, has three
11 distinct applications, new reactors, control and
12 modifications, and changes to human actions.

13 NUREG-0711 has been expanded and upgraded
14 from the previous revision, and NUREG-0700 has been
15 upgraded to address current technologies from its
16 previous revision, and NUREG-1764 is - well, I guess
17 I'd characterize 1764 as a first-of-a-kind document,
18 first-of-a-kind guidance document.

19 We have made an attempt to apply,
20 essentially, risk methods to human performance that
21 have been traditionally applied to systems and
22 equipment performance, and I guess I'm sort of
23 speaking for myself here, as the potential user of
24 this document, I know that as a staff member that
25 NUREG-1764 isn't necessarily the answer, and I kind of

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1 look at it myself as more of a work in progress.

2 I personally see it as presenting a
3 challenge, not only to the staff, but to our
4 stakeholders to address as well, and that's really a
5 challenge that's broader than, in a sense, what we are
6 really dealing with here in terms of specific human
7 actions, it's a challenge to really look at how to
8 better quantify risk associated with human actions in
9 general, making use, at the same time, of current
10 methods, and not necessarily reinventing the wheel or
11 inventing some other alternative method.

12 That's sort of my take on NUREG-1764.

13 CHAIRMAN ROSEN: Now you had, as you said,
14 sent us the comments on these documents. 1764 was one
15 of the documents that was commented on. As I recall,
16 there were relatively few comments, and I don't think
17 they were of any significantly negative sense, and you
18 responded to them, made some changes.

19 MR. LEWIS: Yes.

20 CHAIRMAN ROSEN: To NUREG-1764, as well as
21 to some of the other documents.

22 So, in a sense, the stakeholders at least
23 have seen 1764 as important as it is in the current
24 debates and in the ones that are coming, we haven't
25 gotten a lot of public input.

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1 Now, we are going to get some more, I
2 think, today. We had one request for public comment.

3 MR. PERSENSKY: He's here.

4 CHAIRMAN ROSEN: All right, and we will
5 entertain that in a moment. But, in the written
6 comments we've received, we didn't get a lot of
7 negative, is that right?

8 NEI, the Strategic Teaming and Resource
9 Alliance, which is half a dozen plants, sent some
10 comments.

11 MR. BONGARRA: We had a responder from
12 Syntec.

13 CHAIRMAN ROSEN: Yes, right. The comments
14 weren't particularly negative, and you did respond to
15 many of them.

16 MR. BONGARRA: Yes.

17 CHAIRMAN ROSEN: Okay. But, my point was
18 that there was an opportunity for public involvement
19 in this.

20 MR. BONGARRA: Yes, there was.

21 CHAIRMAN ROSEN: And, it wasn't very
22 negative.

23 MR. BONGARRA: Yes.

24 The next slide is really the - well, to
25 kind of cycle back from where we came, this is the

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1 slide that J. used initially to kick things off, to
2 show the relationship once again of all the major
3 documents to the Standard Review Plan, and how they
4 are integrated into the SRP.

5 And, the final slide is, essentially,
6 presenting several reasons why the staff believes that
7 this revision to the Standard Review Plan Chapter 18
8 should receive endorsement by the ARCS.

9 We believe that the guidance contained in
10 SRP Chapter 18 supports the agency's performance
11 goals, and it provides the staff with a state-of-the
12 art tool that has a strong technical basis.

13 And, with that, I will conclude my remarks
14 and certainly ask the members of the subcommittee for
15 your recommendations, if, indeed, you feel -

16 CHAIRMAN ROSEN: We have a couple of things
17 left to do, and we have quite a bit of time. We have,
18 actually, we were scheduled to go until, what time,
19 4:45, so, you know, we have at least an hour, and we
20 have one member of the public to make comments, and
21 maybe we'll keep you here to react to that if
22 necessary.

23 And then, we want to go around the table
24 with the ACRS members that are and staff, in terms of
25 any sense they have of this thing, just because you've

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1 asked.

2 And then, we want to be sure that - and
3 the third thing we wanted to do is be sure that we
4 plan properly for the meeting with the full committee,
5 make sure that we give you some sense of what we
6 think, of what these remaining three members and what
7 staff members think the full committee will be
8 interested in, because that's always helpful.

9 So, I propose at this point to ask the
10 members of the committee at this point if they want to
11 - no, maybe we should ask for public comment first,
12 and then we'll go forth.

13 So, would you please come forward?

14 MR. PERSENSKY: Bob, do you have a
15 presentation or are you just going to -

16 MR. FULD: (Off mic) I have a couple of
17 pages to read, I guess.

18 CHAIRMAN ROSEN: I think it would be easier
19 if you would introduce yourself and speak with
20 sufficient volume and clarity so you can go right over
21 there and have a seat.

22 MR. FULD: Good afternoon, I wish you all
23 a happy 50th anniversary of Atoms for Peace, which is,
24 actually, next Monday I believe, and if I may
25 introduce myself to those who I don't know here, my

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1 name is Robert Fuld. I am currently certified as a
2 Human Factors Professional by the Board of
3 Certification in Professional Ergonomics, and I've
4 worked mainly in nuclear power since 1976, when I
5 joined the Navy Nuclear Power Program.

6 CHAIRMAN ROSEN: And, your current employer
7 is?

8 MR. FULD: And, let me finish before I
9 answer that by saying that, I am making the following
10 statement as a private individual and as an
11 independent member of my profession, my industry,
12 today. So, perhaps, we can leave it at that.

13 CHAIRMAN ROSEN: Okay, don't need to know.

14 MR. FULD: Okay.

15 And, I'll interject that I have some, I
16 guess, mixed feelings about actually making this
17 statement, but it's not - it's not regarding the
18 technical contents, but just that it's a strong
19 counterpoint to what I feel is a fairly one-sided
20 juggernaut, and so there's an attempt to add some
21 balance here, with, I hope, the truth of things to be
22 sorted out by those who are responsible for doing so.

23 So, my statement concerns Chapter 18 of
24 the Standard Review Plan and the continued impact of
25 the long-running NUREG-0711 initiative on its

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1 contents.

2 0711, as you know, is the human factors
3 engineering program review model, or PRM, and I'm
4 concerned that PRM, generally, promotes the interests
5 of my profession to the detriment of the interest of
6 my industry and, perhaps, the public good, which in a
7 nutshell might be summarized as saying that the
8 growing costs of these activities are often not
9 matched by commensurate safety benefits.

10 Chapter 18 of the SRP is being invited to
11 incorporate and, thus, to validate the essential
12 rhetoric of NUREG-0711, which will bring 0711 a step
13 closer to insinuating itself into the federal
14 regulations.

15 Thus far, the principal means by which it
16 has done so has been to lay claim frequently to the
17 words of 10 CFR 50.34(F)(2)(iii), which states that
18 the applicant must "provide for Commission review of
19 control room design that reflects state-of-the-art
20 human factors principles prior to committing to
21 fabrication or revision of fabricated control room
22 panels and layouts." And, the citation ends with a
23 parenthetical reference to ID-1, indicating the
24 control room design review section of NUREG-660, the
25 post-TMI action plan.

1 It seems reasonable, to me anyway, that
2 the post-TMI lawmakers understood the current state of
3 the art at that time to be adequate, and to supercede
4 past or absent standards that had been used in
5 building plants, so that future design products
6 should, therefore, meet the then current, that is to
7 say, adequate state of the art.

8 But, on the other hand, it's not at all
9 clear that lawmakers intended human factors to become
10 a moving target for applicants, or that lawmakers
11 would have found a monumental state-of-the-art process
12 to be logically equivalent to an adequate - merely
13 adequate design.

14 And, after all, the law requires a design,
15 not a process, one step licensing of advanced plants
16 notwithstanding. So, the PRM, ostensibly a model for
17 process review, and not for the process itself, is,
18 nonetheless, and I think everyone here is well aware
19 of that, easily turns when posing its particular
20 approach as the process, and that this should be of
21 concern on technical grounds, since there is, perhaps,
22 somewhat less than a lot of proof. There is little
23 proof of the general cost effectiveness of this highly
24 bureaucratic approach to design.

25 Indeed, consider its own slight basis, and

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1 I quote again, "The HFE PRM was developed largely on
2 the basis of applied general systems theory, and the
3 DoD systems development process. Other DoD military
4 guidance standards and guidance documents were
5 utilized as well, since the military has been applying
6 HFE longer than industrially commercial systems
7 developers, the process is more formalized and
8 contains detailed design process requirements. Thus,
9 the DoD systems development process was used as a
10 major input."

11 Though, the preceding evidence was struck
12 from Revision 1 of the PRM, the earlier self report,
13 I believe, remains accurate. It also summarizes the
14 collective weight of 19 references offered as evidence
15 of this model's validity, which is to say not really
16 a great deal, but the finding was merely that DoD's
17 design model was then around circa 1990 the oldest and
18 most formal, and granting that this may be true
19 forever, it is still, at best, a weak argument and at
20 worst a red herring, since it is easily overlooked,
21 for example, that the applicability of the DoD model
22 to the nuclear industry was uncritically presumed,
23 that no alternative models were considered, that no
24 evidence was ever offered that DoD's experience with
25 it was successful, efficient or economical, and that,

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1 of course, high costs and bureaucratic inefficiency
2 are DoD traditions.

3 So, little, I think, has changed to really
4 validate the systems approach to design since it was
5 first offered to industry in 1981. Nonetheless, from
6 such modest and relatively obscure bases as Appendix
7 B to the old 0700 have come very aggressive and widely
8 publicized conclusions, and again I quote, "The HFE
9 PRM describes the HFE program elements that are
10 necessary and sufficient to develop an acceptable,
11 detailed design specification and an acceptable
12 implemented design." This is 0711.

13 Fortunately, whether or not the PRM is
14 technically necessary and sufficient, it is not
15 legally required, but it is an increasingly
16 obstructive non-requirement, so much so that human
17 factors of the control room is now considered by the
18 industry the leading risk to successfully bringing a
19 new plant on line within budget and schedule, even
20 more so than software-based protection systems. And,
21 if that isn't correct it's only because my scope of
22 view of a new plant design is not broad enough and I'm
23 not aware of budgets. I know that human factors is on
24 the very top of the NEI punch list, to my
25 understanding.

1 This would clearly be ironic, given the
2 reduced reliance of new designs on operator responses
3 to ensure safety. So, there are other strategies that
4 I feel that can be seen repeatedly in the PRM for
5 promoting its authority and its approach, which
6 includes the use of safety vaguely defined as a
7 rationale for inefficient or unproven methods, the
8 renaming and redefining of existing terms, so as to
9 supplant formerly accepted precedents, a confirmatory
10 research bias that champions largely pre-ordained
11 conclusions and avoids contradictory evidence,
12 promotional self reporting and an inextricable
13 expansion of process, scope and complexity, which
14 contradicts the NRC mandate to reduce unnecessary
15 regulations.

16 And finally, while they are too lengthy to
17 cover here, I'll submit written attachments to justify
18 that several of the analyses and constructs being
19 promoted by the PRM are merely theories or
20 philosophies which are also known as principles in
21 writings, that have yet to be connected in an
22 objective, reliable, or efficient way, with the
23 assurance of nuclear safety. These include the
24 process of function allocation, the measurement of
25 situation awareness, and the use of quasi experimental

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1 validation methods.

2 So, I probably said enough, so let me
3 conclude by saying that I'd welcome the opportunity to
4 discuss this in anymore detail if that interests
5 anyone, and I would also encourage you to scrutinize
6 the comments submitted by NEI on this Chapter 18
7 revision.

8 Thank you very much for your time and
9 attention.

10 CHAIRMAN ROSEN: Well, thank you very much.
11 Those were refreshing and useful and insightful
12 comments. The train, it may have not left the
13 station, but it certainly is chugging up to high
14 speed, and I think cautionary notes like those that
15 you've offered are useful and we'll most certainly
16 take them into account. I do look forward to seeing
17 the additional documentation that you have offered to
18 provide. Thank you very much.

19 MR. SIEBER: Well, could I ask a question?

20 CHAIRMAN ROSEN: Sure, please.

21 MR. SIEBER: Could you please provide a
22 simple example that illustrates the juxtaposition of
23 positions that you talk about, as far as design
24 concept, for example, in an advanced control room, the
25 difference between the NRC method and any other method

1 that might be useful?

2 MR. FULD: I think -

3 MR. SIEBER: Or, just as valid.

4 MR. FULD: - any other method that might
5 be useful is a large space.

6 MR. SIEBER: Too broad, yeah.

7 MR. FULD: Well, it's a desirably large
8 space, because I think that there are many ways people
9 might approach solving their design problems, and it
10 would vary with the organization and with the
11 precedents for similar designs that existed in those
12 organizations.

13 And, they very well might find many of the
14 things that are recommended in 0711 to be useful, but
15 they might prefer to do it in a different way,
16 implement them a different way, talk about them a
17 different way, and because of the great extent, what
18 I heard here described as the detail, in this body of
19 documents in many cases, this makes it difficult to do
20 that without pretty much repeating what is said and
21 spending a lot of effort to justify that you've done
22 what you were told, which frequently is not productive
23 in terms of what you need to do to accomplish a safe
24 and efficient result.

25 So, it is not as effective, I think, in

1 achieving its goals as it might be if there were more
2 flexibility allowed in the implementation. So, I
3 guess from the Chapter 18 standpoint, I would wish
4 that it were less specific in repeating the detailed
5 statements of 0711 and more general -

6 MR. SIEBER: 0700, too.

7 MR. FULD: - I haven't time to go there
8 today, but, perhaps, another time.

9 MR. SIEBER: Okay.

10 MR. FULD: We haven't got time, I don't
11 think.

12 Just to say that I think the pieces, the
13 pieces are, perhaps, valid in themselves, but that the
14 arrangement, the structure, the specification of
15 teams, and the terms that things will be called by,
16 and the attempt at every opportunity to find the law
17 requires you to do things that it doesn't require you
18 to do if you read the law, that this is too strong,
19 you know. And, I believe that the intentions are
20 good, you know, I believe that my profession has
21 something to offer, but I think it's important that
22 what it imposes, that it do no wrong, and it should
23 not be imposing things in the name of hyper
24 conservatism just because they feel - just because it
25 is felt that it won't be less safe as a result, so

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1 it's okay. That's not enough justification.

2 MR. SIEBER: Yes. I'm sort of struck by
3 the analogy of aircraft builders, when they went to
4 the so-called glass cockpit designs, which they
5 applied all of their HRA rules to develop the new
6 concepts. When they turned it over to the pilots
7 there was a lot of consternation that evolved in that
8 turnover process, to the extent that some of the
9 veteran pilots resigned their positions, rather than
10 fly with this new cockpit.

11 And so, I scratch my head and wonder, you
12 know, what was wrong with the transition? Was it
13 engineered too much and not enough attention given to
14 what the actual operator felt he needed to feel
15 confident that he was doing the right thing, that they
16 were simple enough, and he was unlikely to make a
17 mistake, which was part of that problem, or was it
18 just a resistance to change, or were the standards
19 used in the design of the new cockpits inappropriate,
20 either too stringent, too rigid, to take into account
21 the actual fact that a human being operates that
22 machine.

23 And so, the same kinds of questions come
24 forward. If you look at all the control rooms, some
25 of them were pretty easy, and you talk about DoD, that

1 I started out in a DoD plant, which to me I could
2 operate it today if it still existed, you know. On
3 the other hand, I've seen some commercial control
4 rooms that are difficult.

5 Now, when you come up with new concepts,
6 which 0711 is intended to address, I've worked in some
7 - on some European control rooms, some of which I
8 thought, even though I couldn't even understand the
9 language, I could tell what was going on in the
10 control room, and instinctively felt I knew what to do
11 if things went wrong.

12 On the other hand, I've been in some other
13 places where you stand and scratch your head and have
14 some difficulty trying to attract the information and
15 then interpret it and know what to do if intervention
16 was required.

17 So, I think that one has to approach the
18 whole business of the human interface with a pretty
19 broad mind. And so, in a sense I'm agreeing with what
20 you have to say. There should not be so much
21 structure around it that the control rooms are being
22 designed to White Flint. I'd prefer that they were
23 designed someplace else.

24 CHAIRMAN ROSEN: Well, I think you and I
25 have the same prospect - perception, John - Jack.

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1 We've grown up in control rooms that our situational
2 awareness was a matter of a minute usually. You could
3 enter a new control room, at a different plant, as
4 long as the plant was one you understood, or come in
5 after being gone for two weeks in a plant that no one
6 told you anything about, and you went into that
7 control room and in one minute you knew where
8 everything was.

9 You had to go read the log to know what
10 was out of service, you know, but fundamentally you
11 knew in a second, or in a minute let's say, after
12 scanning first the reactor systems control board, the
13 ECC control board, the electrical systems - control
14 board and say, ah-ha, ah-ha, ah-ha, okay. You've got
15 this maintenance going on, now I know where we are, I
16 know my situation awareness.

17 Now, you put that kind of knowledge of an
18 experienced operator into a plant where there's - you
19 walk into the control room, they hand you a mouse, now
20 what do you look at first?

21 MR. SIEBER: That scares me.

22 CHAIRMAN ROSEN: What do you look at
23 first? I mean, well, I guess you do the same thing
24 you did before, which is you click on the reactor
25 systems control board, because the first thing you

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1 want to know is what power level they are at, where
2 are the rods, you know, what boron concentration if
3 you are in PDW, and you want to see the ECCS system
4 status. So, the next thing you do is, you hit the
5 ECCS button and it prints up all the ECCS status.

6 I think you go through all the same kind
7 of thought processes, but you do them mechanically
8 differently. And so, it takes some doing, but I guess
9 that's because you and I are old, and used to other
10 things. I mean, the new operators find this just
11 normal, I mean, the first thing they do when they get
12 on their computer is grab the mouse. That's what they
13 do in the new control rooms, too.

14 MR. FULD: Things are built to be operated,
15 I have no doubt that anything that is geared to
16 operating people will find a way to make it operable
17 and will improve it to make it operable, and in the
18 case of a nuclear power plant, you know, that should
19 be confirmed before the plant is put in operation very
20 certainly, and there's no issue about that.

21 I think my basic issue is that the process
22 by which that is done could have, I think, much more
23 variety and flexibility than is permitted by 0711, and
24 that there is nothing necessarily to indicate that
25 0711 will produce the promised result.

1 Whereas, you know, you can get bad product
2 from a good process, good product from a bad process,
3 and I think all we're saying is that under uncertainty
4 this is one proposal for the best process that could
5 be come up with, and the state-of-the-art process, but
6 I'm not sure that that interpretation is necessarily
7 the interpretation that was originally intended. I
8 think the point was that the product should be
9 adequate, we're concerned that the product should be
10 adequate, and there's many ways I think to make
11 adequate products, because it happens all the time in
12 many walks in engineering.

13 MR. SIEBER: Well, I think that your
14 statement made, to me at least, is food for thought.
15 I appreciate that.

16 CHAIRMAN ROSEN: Well, in 1995 the
17 distinguished chairman of the ACRS, Thomas S. Kress,
18 signed a letter bringing up -

19 MR. KRESS: I remember that, it said
20 something like don't let this become ad hoc
21 regulation.

22 CHAIRMAN ROSEN: - right, right.

23 MR. KRESS: I believe that's what we said.

24 CHAIRMAN ROSEN: Yes, that's exactly what
25 you said. Staff has developed technically defensible

1 principles in Part I and II and a set of guidelines
2 for HSI design reviews in Part II, however, we are
3 concerned that the detailed HSI design review guidance
4 in Part II may discourage the approval of other
5 equally acceptable alternatives.

6 MR. KRESS: That's exactly what you are
7 saying.

8 MR. SIEBER: Yes.

9 CHAIRMAN ROSEN: Either you are reading our
10 letters, or we're reading yours, I'm not sure which.
11 Furthermore, we are concerned that the guidelines in
12 Part II will become de facto regulation.

13 MR. SIEBER: Right.

14 MR. KRESS: And, that was our concern.
15 And, you are saying it probably is happening.

16 MR. FULD: I would say that it's happened,
17 but that's just the opinion from my side, one
18 individual.

19 MR. SIEBER: I was wondering if I could ask
20 you a favor. You know your statement will appear in
21 our transcript, and we will be able to reread it at
22 our leisure. You are obviously reading from
23 something, if you would want to you can provide us
24 with a copy of what you are reading, it would save us
25 from having to wait for the transcript.

1 MR. KRESS: Yes, that would be helpful.

2 MR. SIEBER: Because I'd like to read it.

3 CHAIRMAN ROSEN: But, there's no
4 requirement that you do that.

5 MR. SIEBER: There's no requirement to do
6 that.

7 MR. KRESS: If they'd like to do it, Med
8 here would see that it gets reproduced.

9 MR. EL-ZEFTAWY: Yes, give me a copy, I'll
10 make a copy and I'll bring you back the original.

11 MR. FULD: John knows I'm willing to share
12 my files.

13 CHAIRMAN ROSEN: Are there any comments
14 from the staff with respect to that, or what's been
15 said here? Tom, did you want to add anything?

16 MR. KRESS: No, I think this is good food
17 for thought.

18 MR. PERSENSKY: I'll comment on a couple
19 levels. First -

20 CHAIRMAN ROSEN: We need this to promote
21 dialogue.

22 MR. PERSENSKY: - yes, that, in fact,
23 these comments are not new to us, but, in fact, they
24 are similar to comments that were made in the NEI
25 letter.

1 CHAIRMAN ROSEN: And, in the ACRS letter of
2 1995.

3 MR. PERSENSKY: And, in other places, I
4 mean, this is something that we have dealt with in
5 terms of - you didn't address, for instance, the
6 systems approach, though, you were more concerned with
7 the detail.

8 With regard to the de facto regulation, I
9 know it happens, there's no doubt about it, but we are
10 either forced to provide information or not provide
11 guidance.

12 If you look at the Standard Review Plan
13 that was handed out to you, as in all copies of the
14 Standard Review Plan, there is a statement boldly
15 printed on the bottom -

16 CHAIRMAN ROSEN: It's on the very front
17 page.

18 MR. PERSENSKY: - which says, "Standard
19 Review Plans are not substitutes for regulatory guides
20 or the Commission's regulations, and compliance with
21 them is not required." I mean, that -

22 CHAIRMAN ROSEN: And, anybody who sits on
23 this side of the table, or that side of the table,
24 because anyone who has ever been a licensee knows what
25 that means.

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1 MR. PERSENSKY: - that is a legal
2 requirement, that they be -

3 CHAIRMAN ROSEN: - Do this, or else it's
4 going to take a lot longer to review the submittal.

5 MR. PERSENSKY: You know, Doctor Fuld has
6 presented a statement that, you know, the systems
7 approach has not been tested as far as cost benefit,
8 as well as, you know, is it appropriate to this
9 environment.

10 Part of our defense for that, perhaps, is
11 the fact that if you've looked at the list that was
12 provided in the slides, in terms of the people who
13 have used this process, have used these documents, you
14 know, we have letters of testimonial in terms of its
15 applicability and its value, and its use from that
16 standpoint. So, there are two sides to this coin.

17 The systems approach, I mean, you use the
18 systems approach in engineering field all the time,
19 and -

20 CHAIRMAN ROSEN: You use it in training all
21 the time.

22 MR. PERSENSKY: - yes, the same concept.
23 We take that concept, it's accepted throughout the
24 human factors profession, as a way of doing things,
25 not only in the military, it's also used by NASA, and

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1 FAA, and other applications.

2 CHAIRMAN ROSEN: It has its value in that
3 it tends to make sure you are comprehensive, but I
4 think Doctor Fuld's point is, not that it's not
5 comprehensive, but that it's too comprehensive, it's
6 too detailed, it's too prescriptive, and, perhaps,
7 even too comprehensive, and I think there's two
8 distinct arguments, points of view here.

9 MR. PERSENSKY: And there are, we don't
10 deny that. What we are trying to do is put together
11 a document that meets the state of the art to the
12 extent that is the state of the art for us at this
13 point. It's the state of the art that we have
14 accepted, it's been accepted in the past, like I said,
15 it's been around for, this is the second revision in
16 a sense, as far as 0711, which is the systems
17 approach. It was also as part of 0700 initially.

18 We have not found in the suggestions
19 anything to really replace it that has anymore
20 validity, anymore testing, anymore cost benefit,
21 except to say, well, gee, you know, if we don't have
22 to do that we think we can do it our way, and it would
23 be easier for us.

24 Again, there's no prohibition against
25 providing a different approach. Bob also indicated

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1 that all the parts of 0711 generally are things we
2 would do, we may not do it in that specialized
3 fashion.

4 There is an IEEE standard that uses pretty
5 much the same approach, except that it does allow for
6 some variation in it, and it's definitely not as
7 detailed, but it would also make it much more
8 difficult for our reviewers to be able to make a
9 judgment as to the quality of what is submitted.

10 CHAIRMAN ROSEN: There's an important
11 point. Can I interrupt you right there?

12 MR. PERSENSKY: Yes.

13 CHAIRMAN ROSEN: You talk about why the
14 agency uses a systematic approach, because the agency
15 is trying to manage a large number of reviews and
16 reviewers.

17 If you didn't have that, you just were one
18 - if you had a few reviews and you were doing all the
19 reviews - a few actions to contemplate, and you were
20 the only reviewer, one could argue you don't need all
21 these standards because you know what to look at, you
22 are an experienced human factors professional, and you
23 are going to go right to the heart of the matter, deal
24 with it, and bang, you are going to be done. And, it
25 will be competent.

1 But, when you are dealing with many
2 reviewers and many actions, you are trying to
3 systematize things for logical reasons.

4 MR. BONGARRA: Hence, the Standard Review
5 Plan.

6 MR. PERSENSKY: That's why we have the
7 Standard Review Plan for human factors, but for all
8 the other things as well.

9 MR. SIEBER: But, the back side of that is,
10 in trying to standardize the review process you may be
11 restricting the design process.

12 MR. BONGARRA: Admittedly, this is a two-
13 edged sword, I think.

14 MR. SIEBER: Yes.

15 MR. BONGARRA: And, let me just offer a few
16 thoughts here, I guess, or - having, again, as I
17 mentioned earlier, been on both sides of this fence,
18 it's been a while since I was on the side of the fence
19 that I think Bob is on at the moment here, but I think
20 I do have an appreciation for the pros and the cons
21 for having a prescriptive document from which to work.

22 Certainly, I think I have an appreciation
23 from a regulatory standpoint, probably, perhaps, the
24 pros for having a prescriptive document, if, indeed,
25 this is truly prescriptive, and I think that's

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1 something to be debated as well.

2 The point I'm trying to make, though,
3 really is, basically, this. I think we have to look
4 at the Standard Review Plan and the guidance documents
5 that are associated with it to some degree, you know,
6 in a historical perspective. This is a document,
7 indeed, that does have history to it. It was
8 developed initially during a period of time where I
9 think there were less initiatives on the part of, if
10 you will, independent organizations, other than a
11 regulatory body, there were less interests on the part
12 of other organizations to get involved in this.

13 So, therefore, for whatever reason the
14 agency, if you will, put this document together,
15 again, not in a vacuum. It was put together from
16 resources and sources from various organizations and
17 industries, et cetera.

18 I think we've progressed to some degree,
19 I would hope we have, over the years, such that
20 there's more of an appreciation now that the industry
21 has for - and a sensitivity to a document such as
22 this, so much so that, and I think, J., you mentioned
23 it, and I'm not all that familiar with it, but you and
24 Dick are certainly, and John, with the EPRI efforts to
25 come up with an alternative, perhaps, document to 0700

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1 in this case.

2 So, I think we're -

3 MR. PERSENSKY: Not so much an alternative,
4 but an alternate, it's the design guide as opposed to
5 the review guide.

6 MR. BONGARRA: Okay, a design guide as
7 opposed to a review guide.

8 But, the point that I'm trying to make is
9 that, perhaps, we're seeing, you know, to some degree,
10 a gradual transition occurring within the nuclear
11 power business, within the nuclear power industry,
12 related to this type of activity.

13 And, maybe there is a better alternative
14 to come down the road, it's not there yet.

15 Those are the thoughts.

16 MR. HIGGINS: If I may a couple comments,
17 too.

18 Jim Higgins from Brookhaven.

19 One other way to look at it is, what was
20 the state of the industry in control room design that
21 this was really trying to address? And, what kind of
22 success has it had in doing that?

23 If you look at the way that design
24 organizations designed control rooms, which I believe
25 is in general what Bob is espousing, the way they've

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1 been doing it and have evolved to later on to today.
2 They produced control rooms of the pre-TMI vintage.
3 They produced TMI, and it's clear that, as identified
4 by many independent review organizations, that the
5 control rooms produced at that time, from a human
6 factors standpoint, were very bad. They definitely
7 were identified as a contributor to the accident at
8 Three Mile Island.

9 And, if you look at the various other
10 control rooms, such as Chernobyl, there were some
11 related problems there.

12 So, there was a need for some improved
13 design process guidance for control room design, to go
14 beyond how plants were designed in those days.

15 If you then take a look at the experience
16 of looking at control room modifications and control
17 room designs in the '90s and the early 2000s, where
18 NUREG-0700 was used to review these control rooms
19 designed with processes by industry in the late '80s
20 and the '90s, NUREG-0700 was very valuable in going
21 through in a structured and ordered fashion and
22 identifying weak points of the design process and the
23 design that needed to be addressed. And, that was
24 true for the design submittal to the NRC as part of
25 the advanced reactor reviews, and it was also at some

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1 of the reviews that we've done in other countries
2 using 0700 as a review guidance tool, 0711, I'm sorry.

3 And so, from that standpoint, of a
4 thorough review tool, to go through and not
5 necessarily have all of the aspects of the design done
6 exactly per the elements, but to key the reviewer to
7 see that those functions were addressed and addressed
8 properly, it's very useful in identifying weak points
9 of the design.

10 MR. FULD: And, if I may say, if 0700 made
11 that point clear, that this is to help you track down
12 and ensure that certain functions were accomplished,
13 rather than that these functions were accomplished in
14 this way, that this submittal, you know, from this
15 piece to that piece, this box into this box, that that
16 would be certainly a big improvement, I think in my
17 mind, that kind of flexibility that I would encourage.

18 MR. SIEBER: Well, strangely enough, having
19 done some control room design in the 1960s, and '70s,
20 and early '80s, a lot of the resulting control room
21 layouts came from things like fire protection where
22 you needed to achieve certain kinds of separation, a
23 lack of space, they tried to put everything in the
24 plant that used to be local panels into the control
25 room, with the hope of minimizing the number of

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1 operators. And, the third thing was, all the
2 instruments and controls were COTS, commercial off the
3 shelf, and so concepts like what angle should the
4 light be, and what kind of glass should be in the
5 front of the instrument, that would be - you got what
6 the catalog had. And, where it was placed on the
7 control board had as much to do with fire protection
8 as anything else, because you had to have train
9 separation and things like that, at least to some
10 extent. And, if you ended up with the on/off switch
11 for a pump here, and the flow meter and the amp down
12 here, and the - meter over here, you know, that was
13 one of the problems. There's better ways to do
14 things, but I think you are going to have a lot of
15 drivers affecting what a control room looks like,
16 including what the instrument manufacturers decide to
17 make, and, perhaps, to some extent the operating
18 requirements of the facility itself with regard to how
19 humans are used, and where they are used to control
20 the process, that will have as much influence as some
21 of these other factors.

22 So, the question is, can you operate error
23 free or as close to it as you can get, just by
24 changing certain aspects, or is the whole philosophy
25 something that needs to be worked on. And, I think

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1 the opportunity for dealing with control and
2 instrumentation philosophy, what's readable, what's
3 understandable to the operator, is just as important
4 as the details of the design, frankly.

5 CHAIRMAN ROSEN: In the interest of having
6 a lively session with the full committee on Thursday,
7 let me at least list for you some things I think you
8 should bring to the table.

9 I think, with all due respect to 0711 and
10 0700, the issues that the committee is most interested
11 in are in 1764. You obviously need to say what - you
12 know, what 0711 and 0700 and Chapter 18 do, but, you
13 know, the committee is less interested in that
14 structure than they are in, where's the meat? And so,
15 1764, from the committee's perspective, I mean, meat
16 from the committee's perspective, so you need to talk
17 about that.

18 I also think it would be useful to at
19 least summarize Doctor Fuld's comments, because there
20 is a valid debate, I think, about prescriptiveness
21 versus comprehensiveness and control over the review
22 that is exemplified by Doctor Fuld's comments, and by
23 our letter of November 13, '95, which in a lot of ways
24 raises many of the same points that he just did.

25 Finally, I think you ought to, as we

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1 suggested earlier, talk about our letter of September
2 24, 2002, and the degree to which your thinking, as
3 embodied in Chapter 18 and 0711 and 0700, 1764,
4 addresses any or all of this letter. You know, I don't
5 expect it to be comprehensive, this letter is only a
6 year old, a lot of the actions that are in 0700 and
7 0711, et cetera, predate that. But, to the extent
8 that what you are doing does respond in part, or is
9 responsive in part, to some of these points that are
10 in the September 24, 2002 letter, I think the
11 committee would be interested in that.

12 With that, I'll turn it over to my
13 colleagues. Is there anything else you would
14 recommend?

15 MR. SIEBER: I don't think so. I think
16 that you've summarized pretty well the position, and
17 I think the presentations were good enough for us to
18 understand, basically, what the issues are, even
19 though my feeling is that nothing has changed in the
20 last 20 or 30 years.

21 CHAIRMAN ROSEN: Yes.

22 MR. SIEBER: I felt years ago that NUREG-
23 0700 was pretty prescriptive, and did not give us much
24 room to do much of anything, other than to spend
25 money, and we had plenty of opportunity to do that.

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1 On the other hand, I can't say that it's
2 incorrect either. It doesn't lead us to the path of
3 disaster. The question is, is it the optimum set of
4 documents, the space of 20 years of work has gone into
5 these, and to depart from where you are right now
6 probably would be a difficult task and a setback for
7 the staff to do it.

8 On the other hand, I think the points that
9 have been made by our public commenter are valid
10 points and ought to be taken to heart. You know, we
11 can't have such a rigid revision that we can't
12 consider other viewpoints, even though, you know, in
13 the long run, perhaps, we stick with what the staff
14 has now, and make some modifications, or chart a
15 little different course.

16 And so, while I don't see anything
17 incorrect about what's been done, I think that these
18 factors ought to be considered.

19 CHAIRMAN ROSEN: Thank you.

20 MR. KRESS: I think the problem of how much
21 detail you put in guidance has been around with us a
22 long time. It goes a lot deeper than just this issue.

23 And, it's clear that in order for NRC to
24 be consistent with the reviews in various areas that
25 they need guidance. It's very helpful to them, and

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1 the question of how much detail needs to be in that
2 guidance has never been answered.

3 You always have the problem, it's always
4 going to come up, you put too much detail in it's
5 going to be an ad hoc regulation, in a sense that
6 people will tend to view it as that because it's so
7 much harder to get anything else through.

8 And, that's a problem endemic in the
9 system, and I don't think we can solve that here with
10 these reports. I think they are just following on
11 with what's been standard practice in the past.

12 So, I personally don't think I would have
13 that as part of my assessment of these particular
14 Standard Review Plan parts, I would put that off as a
15 generic type issue with NRC regulations and how they
16 are dealt with, because I think it's a deeper problem.

17 CHAIRMAN ROSEN: Yes, I agree, it is a
18 deeper problem, but I'd like to use it as an example
19 of the problem.

20 MR. KRESS: Well, this might be an example,
21 but the question is, do we use that as a basis to say
22 we don't support this type of thing.

23 CHAIRMAN ROSEN: Oh, no, no, no, absolutely
24 not.

25 MR. KRESS: See, that's the key. I don't

1 think -

2 CHAIRMAN ROSEN: I don't think I would go
3 there, Tom.

4 MR. KRESS: I wouldn't either.

5 CHAIRMAN ROSEN: I think what I would do
6 is, hear this example, hear that competent public
7 input -

8 MR. KRESS: And, make some sort of
9 recommendation that the staff needs to go back and
10 make a study of their whole system.

11 CHAIRMAN ROSEN: No, I wouldn't go that
12 far, what I would do with it is air it in front of the
13 full ACRS, and allow that to be on the public record,
14 to embolden licensees or applicants who wish to take
15 0700 on for valid reasons, in a particular area.

16 MR. KRESS: Okay, that might -

17 CHAIRMAN ROSEN: Because I envision the
18 process working something like this. When someone
19 comes up with a good idea for a control room - for a
20 control function, and is inanimate of the idea, and
21 presents it to his colleagues in the industry, either
22 in a licensee or an applicant, and they say, yeah, but
23 it doesn't meet 0700, and it's a good idea.

24 And, that person doesn't know the next
25 thing to say, which is, well, if you read the

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1 transcript of the ACRS and so and so, and what the
2 staff said in response, nobody ever intended 0700 to
3 be de facto regulation, this is a better way to do
4 business because, and that makes a cogent argument,
5 and we need to involve those people.

6 MR. KRESS: Is that better than having this
7 bold statement in the front of every one of these that
8 says that's allowed as part of the system?

9 CHAIRMAN ROSEN: I don't know. I know for
10 a fact that that bold statement is known by every
11 engineer and licensing engineer in the community, and
12 they also all know that, yeah, if you've got a lot of
13 time and don't care about how much resources you plow
14 into it, it's a balance. You are going to say, this
15 is a better idea, we are going to go fight the reg
16 guide, or this is a better idea but by the time we get
17 done fighting the reg guide we will have lost the ball
18 game.

19 MR. KRESS: But, you see, the problem is I
20 don't see a cure for that, because you have to have
21 this guide, and that's going to be part of the issue.
22 I don't know how to cure it.

23 MR. SIEBER: I think one of the things that
24 we're wrestling with is licensees and other folks'
25 perception that NUREGs, Standard Review Plans, and reg

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1 guides are regulations, which they are not. And,
2 every document, every one of those documents says they
3 are not. It's just one way to view the problem.

4 MR. KRESS: Yes, but I think they are
5 perceptive enough to know that they are not. I think
6 it's a different problem.

7 MR. SIEBER: Well, it's psychological.

8 MR. KRESS: If you are going to go some
9 other route it's going to be a problem and going to be
10 painful, I think that's the perception.

11 MR. SIEBER: Right, and we've all been
12 there, too.

13 CHAIRMAN ROSEN: And, it has to be a huge
14 payoff to take that pain.

15 MR. FLACK: John Flack from the Office of
16 Research. I'm sitting here listening to the
17 discussion that's taking place now.

18 I'm coming from a perspective, a PRA
19 perspective, we know, in fact, human reliability has
20 large uncertainty to begin with. IF you are going to
21 introduce more flexibility in something like that, you
22 are going to compound it, not reduce it.

23 One way to eliminate uncertainty is to be
24 more prescriptive. I don't think there's anything
25 wrong with that if there's a technical basis for it.

1 And, if someone is going to come forward with
2 something and do something different, with a good
3 technical basis, there's no reason why we shouldn't
4 approve it.

5 But, they have put forth as their best
6 shot, and someone could say, well, we want more
7 flexibility, I don't know what that means in this
8 context. I think it can compound this uncertainty
9 that already exists in human performance. It's not
10 like systems where you can put something in, and you
11 can measure the reliability and the availability of
12 that system very precisely within some uncertainty.

13 But, we are dealing with a whole different
14 piece here, and I think we just have to be a little
15 careful about that, and, you know, they came forward,
16 they spent a lot of time thinking about it. They have
17 certainly researched the areas to get the best they
18 could get and to put it down on paper, and again, if
19 somebody comes along with a better mousetrap, you
20 know, a better way of doing it, sure, bring it
21 forward, you know, show the technical basis. I mean,
22 some of it has to do with the devil I know versus the
23 devil I don't know.

24 CHAIRMAN ROSEN: Sure.

25 MR. FLACK: And, just to consider that.

1 CHAIRMAN ROSEN: Which is another way of
2 saying I have operating experience with this and I'm
3 comfortable with that, I don't want to take on
4 something new that I have no operating experience
5 with.

6 MR. FLACK: Yes, but you don't want to
7 close the door to coming forward with something
8 better.

9 CHAIRMAN ROSEN: Right.

10 MR. FLACK: You know, if they can.

11 CHAIRMAN ROSEN: Unless there's a very high
12 driver for it. It's much less costly, it's much more
13 redundant, it's much more testable. I mean, some of
14 those kinds of things might be reasons to - it's more
15 intuitive, more reasons why a human factors
16 professional might say, yeah, that's better.

17 CHAIRMAN ROSEN: Sure.

18 MR. SIEBER: But, I think, John, that's
19 what we're saying, too. Maybe it has a different
20 flavor to it, as it goes back and forth across the
21 room, but my opinion is, if there's nothing incorrect
22 with what it is you are doing, these are not
23 regulations, they are one way to read the regulations.

24 On the other hand, there is the
25 psychological problem that when the reg guide, a NUREG

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1 comes out, the licensing person, and often the design
2 engineer, says I'm going to have an easier life if I
3 just go along, and so that starts to shape the design.

4 And, I don't think there is a right or
5 wrong, you know, it's just the way it is. I don't
6 know that we can solve it.

7 MR. KRESS: One other comment about the
8 full committee meeting. I would like to see a little
9 more detail about the three levels and how they arrive
10 at them through the use of importance factors. I
11 think we didn't get enough attention to that.

12 CHAIRMAN ROSEN: Yes, that would be what
13 Susan -

14 MR. PERSENSKY: Part, Tom?

15 MR. KRESS: The three levels of review and
16 how you arrive - to put things in each level through
17 Fussel-Vessly and RAW.

18 MR. PERSENSKY: Oh, okay, the actual
19 Fussel-Vessly process.

20 MR. KRESS: Yes.

21 CHAIRMAN ROSEN: There are a couple of
22 charts that never even showed up on the screen here,
23 which I thought that was sort of - now that Tom brings
24 it up, I'm seconding his comment, that these two
25 figures, well, actually, four figures, Figure 2.5,

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1 Figure 2.6 and the corresponding LERF pages.

2 MR. SIEBER: Right.

3 CHAIRMAN ROSEN: One has to stare at those
4 for a while to be sure you understand them, and I
5 think they would be useful to show to the full
6 committee.

7 MR. HIGGINS: Jim Higgins here.

8 We have a back-up set of vu-graphs that if
9 that question had come up that we were going to go
10 through, and in those vu-graphs, which we could show
11 to the full committee or to you if you like, but they,
12 basically, go through the development of those four
13 sets of curves and where they came from as reiterated
14 through these different versions and did some testing
15 on them, and the basis for the numerical cutoffs
16 between them.

17 And, I believe you gave the copy of the
18 back-up vu-graphs to them, Paul?

19 MR. LEWIS: No.

20 MR. KRESS: No, oh you still - okay.

21 CHAIRMAN ROSEN: Well, I think we could
22 take the back-up copies if you want, the subcommittee,
23 but I think as Tom has pointed out properly, the full
24 committee may not have read 1764. I don't know
25 whether they have or they haven't, and so there are a

1 number of people -

2 MR. KRESS: I don't think the full
3 committee got the copy of it.

4 CHAIRMAN ROSEN: And, Doctor Apostolakis
5 for sure will have high interest in these.

6 MR. SIEBER: So, we won't give him
7 anything, right?

8 CHAIRMAN ROSEN: If we don't give anything
9 to them, they'll dream it up on their own.

10 MR. KRESS: You've figured out how to deal
11 with them.

12 CHAIRMAN ROSEN: We give it to them,
13 they'll take the whole hour and a half to unsettle, so
14 you'll never get past square one.

15 But anyway, as I said, we want to focus on
16 NUREG-1764, with the addition of showing those charts.
17 We want to hear about Doctor Fuld's comments, even
18 though we'll take as a minor point, that there are
19 some in the public, of whom one person was
20 represented, a qualified member of the human factors
21 profession.

22 MR. KRESS: He may want to show up at the
23 full committee.

24 CHAIRMAN ROSEN: He may want to show up if
25 he wishes to, he's certainly welcome to, and provide

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1 his own.

2 MR. KRESS: Do you want to come to the full
3 committee on Thursday?

4 MR. FULD: (Off mic.)

5 CHAIRMAN ROSEN: Well, you are certainly
6 welcome, if not, some of the people who support and
7 recognize your viewpoint as a useful incite, to at
8 least let the full committee hear it, and then you'll,
9 maybe as a follow-up, say, yeah, we did receive your
10 letter of September 24, 2002, we didn't get it, but we
11 got it.

12 MR. PERSENSKY: Can I ask a few clarifying
13 questions on what you want for Thursday?

14 One, you say to focus on 1764, and I think
15 Tom gave some ideas about moving - getting a little
16 bit more into the Fussel-Vessly/RAW issue, but most of
17 your discussion here was really on Reg Guide 1.174, in
18 terms of the comments you were making.

19 CHAIRMAN ROSEN: Well, I want you to go
20 through how 1764 uses 1.174 to start, and then does
21 the screening process, you know, goes through and
22 finds the levels.

23 MR. PERSENSKY: Okay.

24 CHAIRMAN ROSEN: At which point, it is
25 almost certain that one of the members, if not me,

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1 will jump up and let you have it with what the problem
2 is 1.174. This isn't your problem, but it's what you
3 have to live with.

4 Now remember, there are several thousand
5 people in this agency, all struggling with the same
6 1.174.

7 MR. PERSENSKY: And, we have.

8 CHAIRMAN ROSEN: That's right, and not to
9 say that 1.174 is bad, it's trying to strike a
10 balance, and the balance, you know, is hard.

11 MR. KRESS: And, I like the answer that
12 Susan gave, it's somebody else's problem, not your's.

13 CHAIRMAN ROSEN: Well, the trouble with
14 Susan's answer here is that it may not be their
15 problem, but it is our problem.

16 MR. PERSENSKY: The other question is, you
17 know, we've been talking about this prescriptive
18 issue, now I differentiate between prescriptive and
19 detailed, and I can bring that up in discussion or we
20 can talk about it now.

21 I mean, to me, the issue of detail, we do
22 have a lot of detail. The prescription is that you
23 must do it.

24 MR. SIEBER: It's sort of the eye of the
25 beholder.

1 MR. PERSENSKY: And, I mean, the
2 prescription, as Jack said, is really more an
3 interpretation as opposed to what we intend.

4 You know, if we need the detail, and
5 that's where I need to know what you really want to
6 discuss, the detail or the prescriptive aspect.

7 CHAIRMAN ROSEN: That's a question.

8 MR. PERSENSKY: That's a question to you,
9 yes. I'm asking you a question.

10 CHAIRMAN ROSEN: Well, I think -

11 MR. SIEBER: They aren't allowed to do
12 that, are they?

13 MR. PERSENSKY: Sorry, off limits.

14 CHAIRMAN ROSEN: I don't have to answer
15 that question, but I think I will.

16 I think what you need to do is tell us,
17 tell the full committee about the details, what's in
18 0700, and the other kinds of details. The
19 prescriptiveness issue is something that everybody on
20 the committee knows, and, you know, as Tom expressed,
21 though it's - and we expressed in our 1995 letter what
22 the issue was.

23 So, we can bring it back up and talk about
24 it some more, debate it some more. That's what we
25 like to do is debate things. But, it's likely to have

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1 not much of an impact, other than to, perhaps,
2 embolden the licensee or an applicant some time in the
3 future to say, excuse me, excuse me, let's turn to the
4 first page of this document and read what it says
5 about regulatory guides again.

6 In case any of you reviewers, not you J.,
7 not any of the people sitting up here, but somebody
8 who comes to work in your group who forgets for a day
9 that this is just the regulatory guide.

10 MR. PERSENSKY: Well, one thing I do want
11 to point out, that has happened, I mean it's not that
12 we don't get challenged, and that we have not been
13 challenged. I mean, we've been challenged on lighting
14 standards. We've been challenged on environmental
15 conditions. We've been challenged on various aspects
16 of this, and, you know, mostly we go back and say,
17 okay, what is your basis. If they come back with a
18 sufficient basis, we could accept it.

19 So, it's not, you know, everybody just
20 picks it up and uses it and doesn't challenge it.
21 They do challenge it, based on their particular needs.

22 And, we recognize, those of us that have
23 been around here for a while and beat up by this more
24 than once, we know that we are supposed to accept the
25 challenge, and to -

1 MR. KRESS: Quite often when those
2 challenges are accepted as an acceptable way to do it,
3 it's used as a precedent by other people who want to
4 do it the same way, and it becomes like another
5 regulatory guide.

6 MR. PERSENSKY: Yes, here's another
7 approach.

8 CHAIRMAN ROSEN: There's a fork in the
9 road, kind of like Yogi Berra said, you know, take
10 one.

11 MR. PERSENSKY: And, we could very well,
12 you know, make an addition the next time we make a
13 change. Now, I will also point out, as I did in my
14 last presentation, that the agency has taken a
15 position that this is the last version of 0700.

16 CHAIRMAN ROSEN: It has?

17 MR. PERSENSKY: It has been - the project
18 has been sunset, based on recommendations from the
19 ACRS in that letter that you are talking about.

20 So, based on that, this is the last time
21 you are going to see it.

22 CHAIRMAN ROSEN: That's setting in
23 concrete, isn't it?

24 MR. PERSENSKY: So, but again, the agency
25 responded to the ACRS' comment by saying, okay, we

1 will finish out this version, and then we will sunset
2 that effort, and that was said to you in a response to
3 one of your letters.

4 MR. KRESS: It's been a research report.

5 MR. PERSENSKY: So, we are doing exactly
6 what you asked us to do.

7 CHAIRMAN ROSEN: That's a law of unintended
8 consequence, you said you are getting too
9 prescriptive, and they said, all right, we'll stop and
10 agree with this prescriptive forever.

11 All right, thank you very much.

12 We have one more comment from our
13 designated federal official.

14 MR. EL-ZEFTAWY: I was wondering, I mean,
15 on December 8th you've got to meet the CRGR.

16 MR. PERSENSKY: That's correct.

17 MR. EL-ZEFTAWY: I was wondering, do you
18 have any feedback on that, and what do you think they
19 are going to tell you?

20 MR. PERSENSKY: No, I think we haven't
21 heard anything back yet from them.

22 MR. EL-ZEFTAWY: So, this is the first time
23 CRGR is going to see the document

24 MR. PERSENSKY: Yes. Yes, they made - you
25 know, we asked you, we asked ACRS and we asked CRGR if

1 they wanted to see the documents prior to public
2 comment, and they indicated, no, that they'd wait
3 until after public comment, just as ACRS is.

4 CHAIRMAN ROSEN: Is this typical that CRGR
5 see stuff after ACRS?

6 MR. LEWIS: It's not typical, but we asked
7 both organizations whether they wanted to see it
8 before or after, and both organizations said -

9 MR. PERSENSKY: No, no, he said before,
10 ACRS did. Whether CRGR was before, ACRS was before.

11 MR. LEWIS: Yes, that's why I asked.

12 MR. PERSENSKY: Oh, okay.

13 MR. LEWIS: And, both organizations said
14 that it doesn't make any difference.

15 MR. PERSENSKY: That's -

16 MR. FLACK: Typically, before I think.

17 MR. PERSENSKY: CRGR is typically before.

18 MR. FLACK: But, in this case it didn't
19 work out that way.

20 MR. PERSENSKY: Just a scheduling issue.

21 MR. EL-ZEFTAWY: All right, and that's why
22 I asked.

23 CHAIRMAN ROSEN: Well, we could - CRGR may
24 have all sorts of complaints and send this back to the
25 drawing board. It's unlikely, but I guess that -

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1 MR. PERSENSKY: Yes, there biggest concern
2 is back fit. Is this a back fit? And, the answer is
3 no. So, I mean -

4 MR. SIEBER: It was already back fit.

5 MR. PERSENSKY: Yeah, well, 0700.

6 CHAIRMAN ROSEN: Right, I remember the guy
7 who did it for us, the control room designer did it,
8 that was his - he had it branded on his forehead for
9 about five years.

10 MR. PERSENSKY: But, this is not a new
11 requirement, it's not a requirement at all, regardless
12 of how it is interpreted, it is, in fact, not a
13 requirement by our rules.

14 CHAIRMAN ROSEN: Okay.

15 MR. EL-ZEFTAWY: Okay.

16 CHAIRMAN ROSEN: Well, this has been very
17 interesting, and in a lot of ways for me very
18 instructive. So, I appreciate the opportunity.

19 Thank you all.

20 MR. PERSENSKY: Thank you.

21 CHAIRMAN ROSEN: We are adjourned.

22 (Whereupon, the above-entitled matter was
23 concluded at 4:23 p.m.)

24

25

CERTIFICATE

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

Name of Proceeding: Advisory Committee on
Reactor Safeguards

Subcommittee on Human Factors

Docket Number: n/a

Location: Rockville, MD

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



Jennifer Rosario
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United States Nuclear Regulatory Commission

ACRS Subcommittee on Human Factors Engineering
December 2, 2003

Standard Review Plan (SRP) Chapter 18, Human
Factors Engineering

Meeting Purpose

- Request ACRS Review, Comment and Endorsement of Revision to SRP Chapter 18, **“Human Factors Engineering”**
- Request ACRS Review, Comment, and Endorsement of Principal Reference Documents :
 - NUREG-0711, Rev. 2, **“Human Factors Engineering Program Review Model;”**
 - NUREG-0700, Rev.2, **“Human System-Interface Design Review Guidelines;”**
 - NUREG-1764, **“Guidance for the Review of Changes to Human Actions.”**

Presenters

- James Bongarra, NRR/DIPM/IROB
- Paul Lewis, RES/DSARE/REAHFB
- J. Persensky, RES/DSARE/REAHFB
- Susan Cooper, RES/DRAA/PRAB

Agenda

- SRP, Chapter 18, Rev.2.A
- NUREG - 0711, Rev.2
- NUREG - 0700, Rev.2
- NUREG - 1764
 - Risk-informed screening method
 - Human factors engineering review criteria

SRP Chapter 18

Background

- SRP Chapter 18 is the principal guidance document for human factors engineering
- Summarizes and refers to other detailed guidance documents
- Last revision, 1996
- Since 1996, many updates to related documents

SRP Chapter 18 Overview

- SRP Chapter 18 provides a high level framework for all HFE reviews

- Applications:

Review aspects of –

- o New Plants
- o Control room modifications
- o Modifications affecting human actions

SRP Chapter 18

Overview (2)

■ Three Technical Review Areas

- II.A. Review of New Plants
- II.B. Review of Control Room Modifications
- II.C. Review of Changes to Human Actions

SRP Chapter 18

Overview (3)

■ Three Technical Review Areas

● II.A. Review of New Plants

NUREG-0711

● II.B. Review of Control Room Modifications

NUREG-0700 (NUREG-0711)

● II.C. Review of Changes to Human Actions

NUREG -1764 (NUREG-0711)

SRP Chapter 18

Review Philosophy

- HFE reviews are performed to provide reasonable assurance of safe plant operation
 - 10 CFR Part 50
 - 10 CFR Part 52

- Review of Design Process and Products
 - HF-related problems often related to faulty early design decisions
 - V&V criteria depend on design process quality
 - Timely feedback to applicants and licensees
 - Perform reviews prior to design completion

SRP Chapter 18

Review Approach

- HFE Program follows a systematic approach
 - Functions => Tasks => Detailed Design
 - Assures consideration of all performance shaping factors and human reliability
- HFE is a Life-Cycle Process
 - Concept Planning
 - Design
 - V&V
 - Performance monitoring after design/modifications
 - Graded, partially risk-informed approach

SRP Chapter 18 Revisions

- Modified review elements and acceptance criteria to agree with NURE-0711, Rev.2
- Added review of plant modifications and credited human actions
- Added a graded approach to HFE review based on risk insights

SRP Chapter 18

Technical Basis for Revision

- Address feedback from applications
 - ALWR reviews
 - Plant modernization reviews performed in other countries
 - Feedback from staff and international users

- Incorporate NRC research on human factors engineering

SRP Chapter 18 Summary

- SRP Chapter 18:
 - Existence Since Early 1980's
 - Last Revised – 1996
 - Principal NRC HFE Guidance
 - Refers to Several HFE Related Guidance Documents
 - Latest Revision Upgraded, Partially Risk-informed

**NUREG-0711,
“Human Factors Engineering
Program Review Model”**

NUREG-0711

What is it?

- Complete set of basic HF review elements.
 - All HF reviews.
 - Complete life cycle.
 - Includes reviews of the design process and the design product.
- Elements from NUREG-0711 are adapted in other documents for specific types of review.

NUREG-0711

Review Elements

Planning and Analysis	Design	Verification and Validation	Implementation and Operation
HFE Program Management	Human -System Interface Design	Human Factors Verification and Validation	Design Implementation
Operating Experience Review	Procedure Development		Performance Monitoring
Function Analysis & Allocation	Training Program Development		
Task Analysis			
Staffing & Qualification			
Human Reliability Analysis			

NUREG-0711

Format of Elements

- Background
 - Brief explanation of the rationale and purpose.
- Objective
 - The review objective(s) of the element are defined.
- Licensee submittals
 - Reports, design files review, and observations used by staff.
- Review criteria
 - Acceptance criteria for design process and products and for the final design review.
- Reference documents

NUREG-0711 Relationship to Other NUREGs

NUREG-0800, SRP, Chapt. 18, "Human Factors Engineering"

New Plant

Modification to
Control Room

Modification to
Human Action

NUREG-1764

NUREG-0711: Complete HF review elements

NUREG-0700: Complete human-system interface review guidelines

NUREG-0711

Changes From Prior Version

- Applies to all HF reviews, not just advanced reactors.
- Complete set of basic HF review elements by adding two elements:
 - Design Implementation.
 - Performance Monitoring.
- Changes made to the following elements
 - Function Analysis and Allocation.
 - Human Reliability Analysis.
 - Human-System Interface.
 - Verification and Validation.
- Most of this review guidance previously existed.

**NUREG-0700,
“Human-System Interface
Design Review Guidelines”**

NUREG-0700

Relationship to Other NUREGs

NUREG-0800, SRP, Chapt. 18, "Human Factors Engineering"

New Plant

Modification to
Control Room

Modification to
Human Action

NUREG-1764

NUREG-0711: Complete HF review elements

NUREG-0700: Complete human-system interface review guidelines

NUREG-0700

What is it?

- Complete set of guidelines for reviews of human-system interfaces
- See next slide for review topics

NUREG-0700

Review Topics

- Basis HSI Elements
 - Information Display
 - Interaction and Interface Management
 - Basic Controls
- HSI Systems
 - Alarm Systems
 - Group-View Display System
 - Soft-Control System
 - Computer-Based Procedure Systems
 - Computerized Operator Support Systems
 - Communication Systems
- Workstations and Workplaces
- HSI Support
 - Maintainability of Digital Systems

NUREG-0700

Changes From Prior Version

- Fills gaps in review guidance for digital systems
 - General computer-based information system interfaces
 - Soft controls
 - Computer-based procedures and alarm systems
 - Interface management and navigation

NUREG-0711 and -0700 Significance (1)

- Culmination of much work
- State-of-the-art technical basis
- Up-to-date review guidance for digital HSIs
- Wealth of information and guidance
- These NUREGs establish a new state-of-the-art in comprehensive review guidance for NPPs.

NUREG-0711 and -0700 Significance (2)

- Outside users of NPP regulation and design review
 - KINS: development of Korean next generation reactor regulatory criteria (KOREA)
 - SKI: basis for review of control room upgrades of several plants (Sweden)
 - CSN: basis for review of control room modifications (Spain)
 - IAEA: Temelin NPP design review (Czech Republic)
 - GE: Lungman ABWR NPP control room design review (Taiwan)
 - BNFL: design review of expert system (UK)

NUREG-0711 and -0700 Significance (3)

- Outside users of NPP design
 - EPRI: basis for design of control room modifications for digital I&C upgrades
 - AECL: plant modifications and validation
 - KOPEC: design of new plant and control room upgrades (Korea)
 - KEPRI: design of HSI prototypes (Korea)
 - KAERI: design of advanced control room simulator (Korea)
 - ABB: design of control room upgrades of several plants (Sweden)
 - Halden Reactor Project: design of control room upgrades (Norway)
 - Westinghouse: design of upgrades to NPP (Switzerland)
 - TVA: HF guidance development

NUREG-0711 and -0700 Significance (4)

■ Non-NPP Outside users

- Savannah River Lab: control room design and evaluation
- PNNL: Hanford HSI design
- DoD: Army Research Laboratory design reviews
- DoD: one basis for situation assessment guidance development
- Navy: submarine and aircraft carrier

■ Incorporation into Standards Activities

- International Standards Organization (ISO)
- Institute for Electrical and Electronic Engineers (IEEE)
- International Electrotechnical Commission (IEC)

**NUREG-1764,
“Guidance for the Review of
Changes to Human Actions”**

NUREG-1764

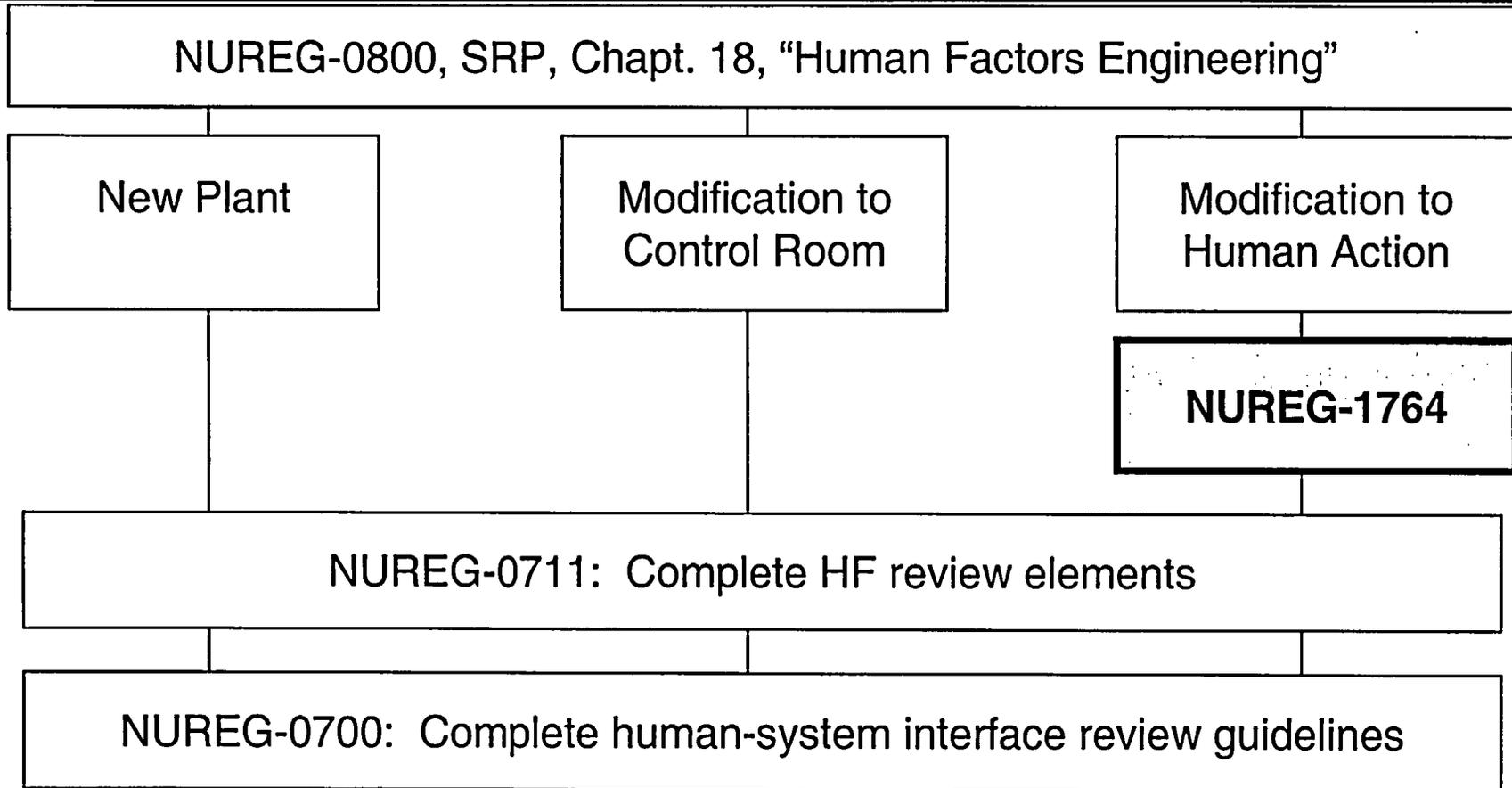
What is it?

- Guidance for the review of changes to human actions.
 - New actions (e.g., substitution of a human action for an automated action, when the automated equipment fails.)
 - Modified actions (e.g., due to new or modified system components.)
 - Modified task demands (e.g., change in amount of time available, or in environment.)

- Risk-informed review guidance
 - The risk screening method determines the level (detailed, medium, brief) of human factors review.

NUREG-1764

Relationship to Other NUREGs



NUREG-1764

Three Phases

1. Risk-screening method
2. Human factors review
 - Level 1 review (most detailed and thorough)
 - Level 2 review (medium)
 - Level 3 review (brief)
3. Results of human factors review is submitted to Integrated Decision-Making (See RG1.174, Section 2.2.6) and to Safety Evaluation Report

NUREG-1764
Phase 1
Risk Screening Method

NUREG-1764, Phase 1

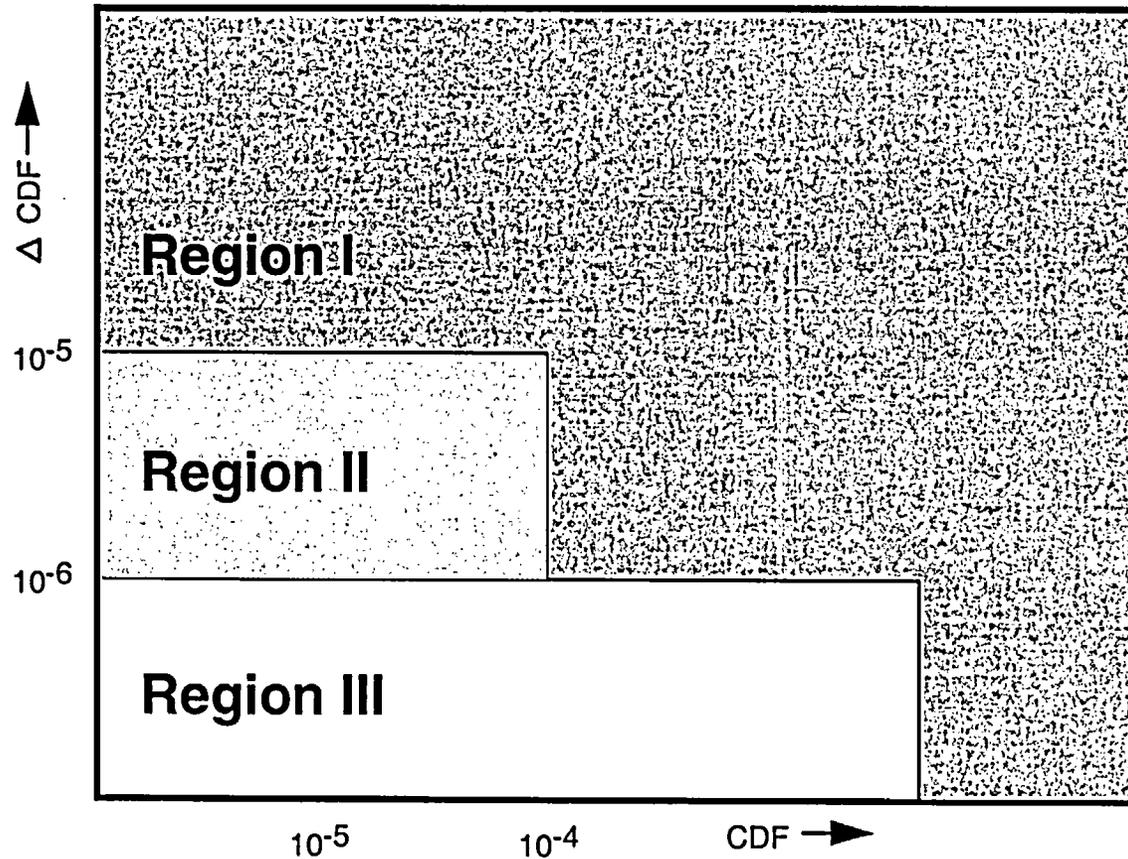
Risk Screening Method Has Four Steps

- Step 1: Change in risk due to modification per RG 1.174.
- Step 2: Evaluation of risk-significance of human action not being performed correctly.
- Step 3: Qualitative evaluation.
- Step 4: Integrated assessment.

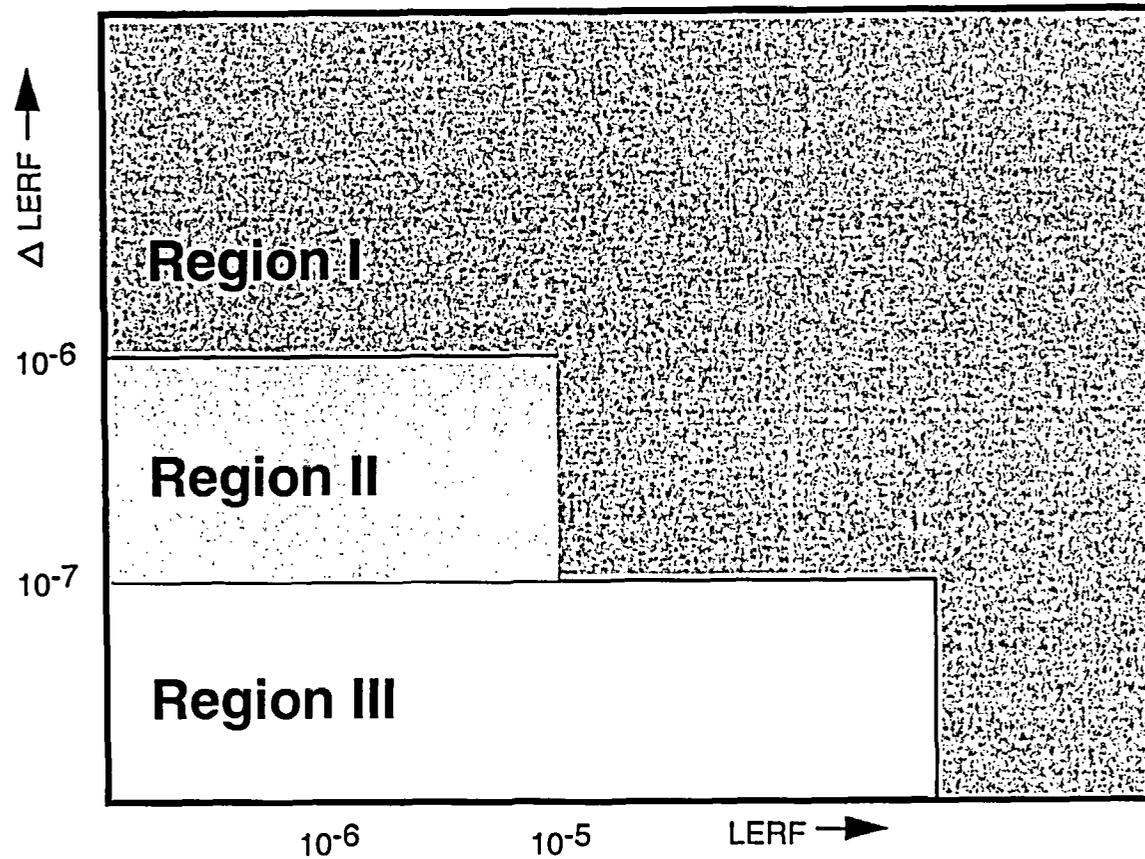
NUREG-1764, Risk Screening Step 1

- Uses a four step process
- Step 1 - change in risk due to modification per RG 1.174
- $\Delta \text{CDF}_{\text{mod}} = [\text{new CDF (with modification in-place)} - \text{current baseline CDF}]$

NUREG-1764, Risk Screening, Step 1 CDF Screening Guide



NUREG-1764, Risk Screening, Step 1 LERF Screening Guide



NUREG-1764, Risk Screening, Step 1 (cont.)

- If HA only and Region I – Do a Level I HFE review.
- Otherwise - go to Step 2 to evaluate risk-significance of human-action not being performed correctly

NUREG-1764, Risk Screening Step 2

- Step 2 - evaluation of risk-significance of human action not being performed correctly
- Evaluates risk importance of HA based on both RAW and FV importance measures.
- Preliminary determination of Review level for HA as Level I, II, or III.

NUREG-1764, Risk Screening Step 3

- Step 3 - Qualitative Evaluation
 - Allows the screener to reduce or elevate the Level of HFE Review
 - Based on factors such as:
 - ➔ Personnel functions and tasks.
 - ➔ Design support for task performance.
 - ➔ Performance shaping factors.

NUREG-1764, Risk Screening Step 4

- Step 4 Integrated Assessment
 - Integrates the results generated in Steps 1 through 3
 - Provides a Table that gives the Level of HFE review based on screening.
 - Conclusion of Risk Screening: The level (I, II, or III) of human factors review.

NUREG-1764
Phase 2
Human Factors Review

NUREG-1764, HF Review

Three Levels of HF Review

- Level I is the most detailed review
 - Review areas are adapted from NUREG-0711
- Level II is a moderately detailed review
 - Review areas are adapted from NUREG-0711
- Level III is a brief review

NUREG-1764, HF Review Previous Guidance

- Most of the HF Review guidance previously existed.
 - Information Notice 97-78, "Crediting Operator Actions in Place of Automatic Actions and Modifications of Operator Actions, Including Response Times."
 - Information Notice 91-18, "Information to Licensees Regarding Two NRC Inspection Manual Sections on Resolution of Degraded and Nonconforming Conditions and on Operability."
 - NUREG-0711

NUREG-1764, Phase 3 HF Review Decision

- Result of human factors review is submitted to Integrated Decision-Making (See RG1.174, Section 2.2.6) and to Safety Evaluation Report

SRP Chapter 18 and Related NUREGs Summary

- SRP Chapter 18 now has three applications
 - Most of the review guidance previously existed
- NUREG-0711
 - Application scope expanded from advanced reactors to all reactors
 - New review guidance for existing review elements
 - Two new elements
- NUREG-0700 added review guidance for specific HSI topics
 - Computer-based procedures
 - Soft controls
- NUREG-1764
 - This is a new document.
 - It contains (1) a risk screening method and (2) graded HF review criteria.
- Most of the added review guidance previously existed.

SRP, Chapter 18, "Human Factors Engineering" Summary

NUREG-0800, SRP, Chapt. 18, "Human Factors Engineering"

New Plant

Modification to
Control Room

Modification to
Human Action

NUREG-1764

NUREG-0711: Complete HF review elements

NUREG-0700: Complete human-system interface review guidelines

SRP Chapter 18 and Related NUREGs

Significance: Promote NRC Performance Goals

- Reduce unnecessary burden
 - NUREG-1764 has a risk screening method
 - They are guidelines, not requirements
- Improve regulatory efficiency
 - Clear, detailed review guidance
 - Detailed, because users want detail
 - Organized package
 - Role of each NUREG is well defined
 - Standardized formats
- Maintain safety
 - Risk screen provides detailed review for risk important human actions.
 - Reduces regulatory uncertainty, which can cause licensees to delay safety improvements
 - Contains review guidance for new (digital) technologies
- Further implement NRC policy on risk-informed regulation

Technical Reports Related to the Development of HFE Review Guidance

Brown, W. (2001). *Update of NUREG-0700 control room and work place environment review guidance* (BNL Technical Report E6835-T5-1-6/01). Upton, New York: Brookhaven National Laboratory.

Brown, W., O'Hara, J., and Higgins, J. (2000). *Advance alarm systems: Guidance development and technical basis* (NUREG/CR-6684). Washington, D.C.: U.S. Nuclear Regulatory Commission.

Echeverria, D., Barnes, V., Bitner, A., Durbin, N., Fawcett-Long, J., Moore, C., Slavich, A., Terril, B., Westra, C., Wieringa, D., Wilson, R., Draper, D., Morisseau, D., and Persensky, J. (1994a). *The impact of environmental condition on human performance: a critical review of the literature* (NUREG/CR-5680, Vol.1). Washington, D.C.: U.S. Nuclear Regulatory Commission.

Echeverria, D., Barnes, V., Bitner, A., Durbin, N., Fawcett-Long, J., Moore, C., Slavich, A., Terril, B., Westra, C., Wieringa, D., Wilson, R., Draper, D., Morisseau, D., and J. Persensky, J. (1994B). *The impact of environmental condition on human performance* (NUREG/CR-5680, Vol.2). Washington, D.C.: U.S. Nuclear Regulatory Commission.

Higgins, J. and Nasta, K. (1996). *HFE Insights For Advanced Reactors Based Upon Operating Experience* (NUREG/CR-6400). Washington, D.C.: U.S. Nuclear Regulatory Commission.

Higgins, J., O'Hara, J., Stubler, W., & Deem, R. (1999). *Summary of credit of past operator action cases* (Report No. W6022-T1-1-7/99). Upton, New York: Brookhaven National Laboratory.

Higgins, J. and O'Hara, J. (2000). *Proposed Approach for Reviewing Changes to Risk-Important Human Actions* (NUREG/CR-6689). Washington, D.C.: U.S. Nuclear Regulatory Commission.

O'Hara, J. and Brown, W. (2002). *The Development and Revision of the NRC's HFE Design Review Guidance: NUREG-0711 and NUREG-0700*. (W6546-1-9/02). Washington, D.C.: U.S. Nuclear Regulatory Commission.

O'Hara, J. (1994). *Advanced human system interface design review guideline* (NUREG/CR-5908). Washington, D.C.: U.S. Nuclear Regulatory Commission.

O'Hara, J. and Brown, W. (2002). *The effects of interface management tasks on crew performance and safety in complex, computer-based systems*. (NUREG/CR-6690). Washington, D.C.: U.S. Nuclear Regulatory Commission.

O'Hara, J. and Brown, W. (2001). *Human-system interface management: Human factors review guidance* (BNL Technical Report W6546-T6A-1-3/01). Upton, New York: Brookhaven National Laboratory.

O'Hara, J., Brown, W., Hallbert, B., Skråning, G., Wachtel, J., and Persensky, J. (2000). *The*

Effects of Alarm Display, Processing, and Availability on Crew Performance (NUREG/CR-6691). Washington, D.C.: U.S. Nuclear Regulatory Commission.

O'Hara, J., Brown, W., Higgins, J., and Stubler, W. (1994). *Human factors engineering guidelines for the review of advanced alarm systems* (NUREG/CR-6105). Washington, D.C.: U.S. Nuclear Regulatory Commission.

O'Hara, J., Brown, W., and Nasta, K. (1996). *Development of NUREG, 0700, Revision 1* (BNL Technical Report L-1317-2-12/96). Upton, New York: Brookhaven National Laboratory.

O'Hara, J., Higgins, J., and Kramer, J. (2000). *Advanced Information Systems: Technical Basis and Human Factors Review Guidance* (NUREG/CR-6633). Washington, D.C.: U.S. Nuclear Regulatory Commission.

O'Hara, J., Higgins, J., Stubler, W., and Kramer, J. (2000). *Computer-Based Procedure Systems: Technical Basis and Human Factors Review Guidance* (NUREG/CR-6634). Washington, D.C.: U.S. Nuclear Regulatory Commission.

O'Hara, J., Stubler, W., Brown, W., and Higgins, J. (1997). *Integrated System Validation: Methodology and Review Criteria* (NUREG/CR-6393). Washington, D.C.: U.S. Nuclear Regulatory Commission.

O'Hara, J., Stubler, W., and Higgins, J. (1998). *The development of HFE design review guidance for hybrid human-system interfaces* (BNL Report J6012-T6-12/98). Upton, New York: Brookhaven National Laboratory.

O'Hara, J., Stubler, W., and Higgins, J. (1996). *Hybrid human-system interfaces: Human factors considerations* (BNL Report J6012-T1-4/96). Upton, New York: Brookhaven National Laboratory.

Roth, E. and O'Hara, J. (2002). *Integrating digital and conventional human system interface technology: Lessons learned from a control room modernization program*. (NUREG/CR-6749). Washington, D.C.: U.S. Nuclear Regulatory Commission.

Stubler, W., Higgins, J., and Kramer, J. (2000). *Maintenance of Digital Systems: Technical Basis and Human Factors Review Guidance* (NUREG/CR-6636). Washington, D.C.: U.S. Nuclear Regulatory Commission.

Stubler, W. and O'Hara, J. (1996a). *Group-view display support document* (BNL Report E2090-T4-4-4/95, Rev. 1). Upton, New York: Brookhaven National Laboratory.

Stubler, W. and O'Hara, J. (1996b). *Human-System Interface Design Process and Review Criteria* (BNL Report E2090-T4-5-11/95). Upton, New York: Brookhaven National Laboratory.

Stubler, W., O'Hara, J., Higgins, J., and Kramer, J. (2000). *Human-System Interface and Plant Modernization Process: Technical Basis and Human Factors Review Guidance* (NUREG/CR-6637). Washington, D.C.: U.S. Nuclear Regulatory Commission.

Stubler, W., O'Hara, J., and Kramer, J. (2000). *Soft Controls: Technical Basis and Human Factors Review Guidance* (NUREG/CR-6635). Washington, D.C.: U.S. Nuclear Regulatory Commission.