Official Transcript of Proceedings

NUCLEAR REGULATORY COMMISSION

Title: Advisory Committee on Reactor Safeguards
Subcommittee on Human Factors

Docket Number: (not applicable)

Location: Rockville, Maryland

Date: Tuesday, December 2, 2003

Work Order No.: NRC-1220 Pages 1-143

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NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS (ACRS)

MEETING OF THE SUBCOMMITTEE ON HUMAN FACTORS

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ROCKVILLE, MARYLAND

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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

ALSO PRESENT:

James Bongarra	NRR/DIPM/IROB
Paul Lewis	RES/DSARE/REAHFB
J. Persensky	RES/DSARE/REAHFB
Susan Cooper	RES/DRAA/PRAB
John O'Hara	BNL
Jim Higgins	BNL
Richard Eckenrode	NRR/DIPM/IROB
Joel Kramer	RES/DSARE/REAHFB
Molly Keefe	RES/DSARE/REAHFB
Gareth Parry	NRR/DSSA
John Flack	RES/DSARE/REAHFB
Jose Ibarra	RES/DSARE/REAHFB
Robert Fuld	

A-G-E-N-D-A

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 with 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.

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

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

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

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

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

We will now proceed with the meeting.

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

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

CHAIRMAN ROSEN: All right.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

engineering and upgrades to human-system interfaces.

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

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

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

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

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

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

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

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

CHAIRMAN ROSEN: I will note, if I can interrupt for a moment –

MR. BONGARRA: Please.

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

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

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

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

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

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

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

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

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

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

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

CHAIRMAN ROSEN: Spring 2004.

MR. PERSENSKY: Yes.

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

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

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

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

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

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

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

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

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

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

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

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

also addressed in the guidance contained in Chapter 18.

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

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

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

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

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

NUREG-0711, however, has overall design

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

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

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

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

10 CFR 52, for new plants, invokes Part 50

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

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

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

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

these concepts as well

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

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

CHAIRMAN ROSEN: Why do you say partially?

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

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

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

MR. BONGARRA: Yes.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

CHAIRMAN ROSEN: Good.

MR. PERSENSKY: Thank you.

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

MR. BONGARRA: All right.

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

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

Unless the subcommittee has further

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

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

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

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

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

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

MR. SIEBER: Sir, could you talk into the

mike?

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

MR. LEWIS: Oh, I'm sorry.

MR. PERSENSKY: This is going to be tricky.

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

DOCTOR KIRBY: You need a mirror.

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

CHAIRMAN ROSEN: You aren't certified.

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

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

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

MR. PERSENSKY: Thank you.

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

HRA, but the integration of the HRA into the human factors function, the kind of information that human factors people give the HRA people and the risk importance of the tasks that the HRA people will in turn give back to the human –

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

MR. LEWIS: Yes.

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

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

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

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

So, this slide shows the format of the

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

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

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

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

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

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

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

Oh, do you have any questions on 0711?

Okay, we'll go on to 0700.

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

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

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

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

MR. LEWIS: You read it all.

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

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

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

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

MR. LEWIS: Yes.

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

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

MR. LEWIS: Yes.

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

MR. LEWIS: Yes.

CHAIRMAN ROSEN: More about digital.

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

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

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

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

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

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

CHAIRMAN ROSEN: Thank you.

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

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

CHAIRMAN ROSEN: It becomes an HED then?

MR. LEWIS: AGD?

CHAIRMAN ROSEN: HED, human error discrepancy.

MR. LEWIS: Oh, yes.

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

MR. LEWIS: That's right.

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

CHAIRMAN ROSEN: One of the ACRS' concerns,

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

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

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

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

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

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

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

ball out of the park.

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

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

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

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

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

MR. O'HARA: Sue.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

operator.

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

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

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

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

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

The EPRI document is really focused on

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

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

MR. SIEBER: For current licensees.

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

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

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

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

MR. SIEBER: Yes, right.

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

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

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

The changes –

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

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

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

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

MR. LEWIS: That's right.

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

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

CHAIRMAN ROSEN: As opposed to hard.

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

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

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

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

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

MR. SIEBER: Not specifically, the standards do.

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

MR. PERSENSKY: Right.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

MR. SIEBER: They didn't understand it.

CHAIRMAN ROSEN: They didn't understand.

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

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

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

John and I and others were involved in.

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

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

MR. LEWIS: Yes.

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

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

MR. LEWIS: Yes.

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

MR. LEWIS: Yes.

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

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

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

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

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

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

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

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

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

So, yes, it's a symbiotic situation.

MR. SIEBER: That brings up an interesting

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

MR. PERSENSKY: John?

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

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

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

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

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

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

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

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

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

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

So –

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

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

MR. PERSENSKY: Jim?

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

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

MR. HIGGINS: Jim Higgins from Brookhaven Lab.

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

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

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

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

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

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

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

NUREG-1764 has three phases. The first is

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

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

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

Go right ahead now.

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

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

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

MR. SIEBER: You should take credit, too.

MS. COOPER: All right, thank you.

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

something.

MS. COOPER: All right.

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

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

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

There are four steps in the risk screening

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

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

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

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

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

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

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

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

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

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

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

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

MS. COOPER: Okay, like I said –

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

MS. COOPER: – well, like I said –

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

CHAIRMAN ROSEN: Let's point out that I

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

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

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

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

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

MS. COOPER: I won't disagree, I'm –

MR. POWERS: That presumes that you have friends.

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

CHAIRMAN ROSEN: I'm aware of that.

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

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

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

MS. COOPER: Yes.

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

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

recognize that that's the case.

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

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

MS. COOPER: That's correct.

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

MS. COOPER: Has it been tested?

MR. POWERS: Yes.

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

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

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

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

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

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

MR. HIGGINS: Yes, Jim Higgins.

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

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

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

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

MR. POWERS: That's not surprising.

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

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

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

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

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

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

were we getting a reasonable distribution.

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

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

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

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

technical basis document, when it does get finalized.

Sorry if that was a little long winded, but –

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

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

Now, is that –

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

CHAIRMAN ROSEN: It would not?

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

MS. COOPER: Testing, well –

MR. POWERS: He tells me –

MS. COOPER: – yes, but all I was saying

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

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

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

CHAIRMAN ROSEN: From other models, right?

MS. COOPER: Right.

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

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

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

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

CHAIRMAN ROSEN: Right.

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

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

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

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

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

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

CHAIRMAN ROSEN: Yes.

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

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

CHAIRMAN ROSEN: Well, we can invite the PRA folks, though, because –

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

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

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

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

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

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

MR. PARRY: Yes, this is Gareth Parry.

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

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

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

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

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

MR. PARRY: Good.

CHAIRMAN ROSEN: It's a painful thing to have to do, because –

MS. COOPER: It's short.

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

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

MR. PARRY: You really –

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

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

But, I think this – well, this is really getting off the mark, though.

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

MR. PARRY: Yes.

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

MR. PARRY: And, the reason –

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

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

plants.

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

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

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

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

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

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

MR. PARRY: Okay.

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

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

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

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

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

MS. COOPER: Yes, there is another approach.

MR. PARRY: There's another –

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

MR. PARRY: Yes.

MR. LEWIS: Different group of people.

MR. PARRY: Different group of people, yes.

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

axis, the delta CDF.

MR. PARRY: Yes.

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

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

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

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

MS. COOPER: We are using –

MR. PARRY: Yes.

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

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

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

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

set in stone.

MR. PARRY: I think I'd like to add –

MR. KRESS: The second question, part of this question is –

MR. PARRY: – okay.

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

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

MR. KRESS: Sensitivity.

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

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

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

in RAW, due to other uncertainties in the model.

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

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

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

MS. COOPER: That's right.

CHAIRMAN ROSEN: But, you provoked pretty much all of the –

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

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

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

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

CHAIRMAN ROSEN: Until the break.

MS. COOPER: Okay, all right.

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

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

I should say CDF and LERF.

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

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

MS. COOPER: Doing a Level I review.

CHAIRMAN ROSEN: This one here.

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

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

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

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

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

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

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

CHAIRMAN ROSEN: All right.

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

CHAIRMAN ROSEN: Yes, you did well.

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

CHAIRMAN ROSEN: Anymore questions.

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

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

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

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

MR. LEWIS: Yes.

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

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

MS. COOPER: Yes.

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

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

It would be my presumption for a non-risk-

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

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

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

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

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

MR. LEWIS: Yes.

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

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

MR. LEWIS: Yes, that causes a problem.

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

CHAIRMAN ROSEN: Level III is a brief review.

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

CHAIRMAN ROSEN: Yes.

Is Level III so brief as no review?

MR. LEWIS: No.

Well, Jim, do you want to address that?

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

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

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

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

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

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

MR. BONGARRA: Jim, are you recalling something?

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

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

MR. HIGGINS: That's right.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

MR. SIEBER: Not safety related.

CHAIRMAN ROSEN: – not safety related turned out to be risk significant.

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

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

MR. BONGARRA: It's a trap.

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

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

Anyway – I interrupted your presentation by asking for some tangible examples of these things.

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

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

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

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

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

Do you have any questions on that?

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

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

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

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

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

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

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

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

MR. LEWIS: Yes.

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

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

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

MR. PERSENSKY: He's here.

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

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

MR. BONGARRA: We had a responder from Syntec.

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

MR. BONGARRA: Yes.

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

MR. BONGARRA: Yes, there was.

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

MR. BONGARRA: Yes.

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

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

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

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

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

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

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

asked.

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

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

So, would you please come forward?

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

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

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

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

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

CHAIRMAN ROSEN: And, your current employer is?

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

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

MR. FULD: Okay.

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

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

contents.

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

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

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

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

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

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

Indeed, consider its own slight basis, and

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

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

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

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

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

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

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

validation methods.

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

Thank you very much for your time and attention.

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

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

CHAIRMAN ROSEN: Sure, please.

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

that might be useful?

MR. FULD: I think –

MR. SIEBER: Or, just as valid.

MR. FULD: – any other method that might be useful is a large space.

MR. SIEBER: Too broad, yeah.

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

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

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

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

MR. SIEBER: 0700, too.

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

MR. SIEBER: Okay.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

MR. SIEBER: That scares me.

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

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

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

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

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

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

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

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

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

CHAIRMAN ROSEN: – right, right.

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

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

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

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

MR. SIEBER: Yes.

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

MR. SIEBER: Right.

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

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

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

MR. KRESS: Yes, that would be helpful.

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

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

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

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

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

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

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

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

MR. PERSENSKY: I'll comment on a couple levels. First –

CHAIRMAN ROSEN: We need this to promote dialogue.

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

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

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

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

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

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

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

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

MR. PERSENSKY: – that is a legal requirement, that they be –

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

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

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

The systems approach, I mean, you use the systems approach in engineering field all the time, and –

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

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

FAA, and other applications.

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

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

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

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

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

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

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

MR. PERSENSKY: Yes.

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

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

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

MR. BONGARRA: Hence, the Standard Review Plan.

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

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

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

MR. SIEBER: Yes.

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

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

something to be debated as well.

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

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

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

in this case.

So, I think we're –

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

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

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

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

Those are the thoughts.

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

Jim Higgins from Brookhaven.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Finally, I think you ought to, as we

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

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

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

CHAIRMAN ROSEN: Yes.

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

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

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

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

CHAIRMAN ROSEN: Thank you.

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

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

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

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

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

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

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

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

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

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

think –

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

MR. KRESS: I wouldn't either.

CHAIRMAN ROSEN: I think what I would do is, hear this example, hear that competent public input –

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

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

MR. KRESS: Okay, that might –

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

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

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

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

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

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

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

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

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

MR. SIEBER: Well, it's psychological.

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

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

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

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

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

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

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

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

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

CHAIRMAN ROSEN: Sure.

MR. FLACK: And, just to consider that.

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

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

CHAIRMAN ROSEN: Right.

MR. FLACK: You know, if they can.

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

CHAIRMAN ROSEN: Sure.

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

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

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

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

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

CHAIRMAN ROSEN: Yes, that would be what Susan –

MR. PERSENSKY: Part, Tom?

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

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

MR. KRESS: Yes.

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

Figure 2.6 and the corresponding LERF pages.

MR. SIEBER: Right.

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

MR. HIGGINS: Jim Higgins here.

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

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

MR. LEWIS: No.

MR. KRESS: No, oh you still – okay.

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

number of people –

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

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

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

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

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

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

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

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

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

his own.

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

MR. FULD: (Off mic.)

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

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

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

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

MR. PERSENSKY: Okay.

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

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

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

MR. PERSENSKY: And, we have.

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

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

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

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

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

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

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

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

CHAIRMAN ROSEN: That's a question.

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

CHAIRMAN ROSEN: Well, I think –

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

MR. PERSENSKY: Sorry, off limits.

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

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

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

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

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

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

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

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

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

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

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

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

CHAIRMAN ROSEN: It has?

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

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

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

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

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

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

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

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

All right, thank you very much.

We have one more comment from our designated federal official.

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

MR. PERSENSKY: That's correct.

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

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

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

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

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

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

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

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

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

MR. PERSENSKY: Oh, okay.

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

MR. PERSENSKY: That's –

MR. FLACK: Typically, before I think.

MR. PERSENSKY: CRGR is typically before.

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

MR. PERSENSKY: Just a scheduling issue.

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

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

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

MR. SIEBER: It was already back fit.

MR. PERSENSKY: Yeah, well, 0700.

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

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

CHAIRMAN ROSEN: Okay.

MR. EL-ZEFTAWY: Okay.

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

Thank you all.

MR. PERSENSKY: Thank you.

CHAIRMAN ROSEN: We are adjourned.

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