UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

Title: BRIEFING ON RISK-BASED TECHNICAL SPECIFICATION PROGRAM

Location: ROCKVILLE, MARYLAND

Date: APRIL 13, 1990

Pages: 56 PAGES

NEAL R. GROSS AND CO., INC.

COURT REPORTERS AND TRANSCRIBERS
1323 Rhode Island Avenue, Northwest
Washington, D.C. 20005
(202) 234-4433

DISCLAIMER

This is an unofficial transcript of a meeting of the United States Nuclear Regulatory Commission held on April 13, 1990, in the Commission's office at One White Flint North, Rockville, Maryland. The meeting was open to public attendance and observation. This transcript has not been reviewed, corrected or edited, and it may contain inaccuracies.

The transcript is intended solely for general informational purposes. As provided by 10 CFR 9.103, it is not part of the formal or informal record of decision of the matters discussed. Expressions of opinion in this transcript do not necessarily reflect final determination or beliefs. No pleading or other paper may be filed with the Commission in any proceeding as the result of, or addressed to, any statement or argument contained herein, except as the Commission may authorize.

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

- - - -

BRIEFING ON RISK-BASED TECHNICAL
SPECIFICATION PROGRAM

- - - -

PUBLIC MEETING

Nuclear Regulatory Commission
One White Flint North
Rockville, Maryland

Friday, April 13, 1990

The Commission met in open session, pursuant to notice, at 10:00 a.m., Kenneth M. Carr, Chairman, presiding.

COMMISSIONERS PRESENT:

KENNETH M. CARR, Chairman of the Commission
THOMAS M. ROBERTS, Commissioner
KENNETH C. ROGERS, Commissioner
JAMES R. CURTISS, Commissioner
FORREST J. REMICK, Commissioner

STAFF AND PRESENTERS SEATED AT THE COMMISSION TABLE:

WILLIAM RUSSELL, Nuclear Reactor Regulation
DOCTOR THOMAS MURLEY, Nuclear Reactor Regulation
JAMES M. TAYLOR, Nuclear Reactor Regulation
CHARLES E. ROSSI, Nuclear Reactor Regulation
RICHARD LOBEL, Nuclear Reactor Regulation

SAMUEL J. CHILK, Secretary
WILLIAM C. PARLER, General Counsel

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

10:00 a.m.

CHAIRMAN CARR: Good morning, ladies and gentlemen. The purpose of today's meeting is for the staff to brief the Commission on the status of efforts in developing risk-based technical specifications for nuclear power plants. This activity is part of the ongoing Technical Specification Improvement Program. The Commission was last briefed on the Technical Specification Improvement Program in June of 1989. At that briefing the staff offered to provide this separate briefing on risk-based on technical specifications.

I understand that copies of the briefing slides are available at the entrance to the meeting room.

Do my fellow Commissioners have any opening comments? If not, Mr. Taylor, please proceed.

COMMISSIONER ROBERTS: I'm going out of town for the weekend, and I'm leaving at 11:00. And I'll read the transcript for the balance of the meeting, but I may not be here for the end of the meeting.

CHAIRMAN CARR: They'll be quick today.

MR. TAYLOR: We promise. We promise.

Good morning. I would like to note in introducing the staff, that on this topic the staff is very much at the evaluative and exploratory stage of studying and utilizing risk-based technical specifications. To this stage, as you'll hear in briefing, we are seeing benefits and insights into current technical specifications in areas such as surveillance intervals and permissable or allowed outage time of equipment. So, we're in the early stages.

And with that thought, I will introduce those at the table. Tom Murley, Bill Russell. To my left, Ernie Rossi and Rich Lobel, all from the Office of Nuclear Reactor Regulation. Bill Russell will commence the details of the briefing.

MR. RUSSELL: I'd like to emphasize that this is an area that we are giving senior management attention to. Doctor Murley has asked me to pull a number of activities together that relate to this. We are, in fact, planning a visit, that is Tom and I, to Heysham in June to get firsthand information. And we also are looking into related activities. For example, the issues which are coming out of the Vogtle IIT with respect to activities during shutdown. As Mr. Taylor mentioned, issues related to

allowable outage times and how those LCOs are used. We're pulling information together. We expect to be in a position to discuss this at the senior management meeting in June and would be prepared to brief the Commission on these activities at the time we do an update briefing on the Tech Spec Improvement Program, which would be after the senior management meeting.

With that brief discussion, I'd like to turn it to Rich Lobel who will walk you through the presentation.

MR. LOBEL: Good morning. My name is Richard Lobel and I'm in the Technical Specifications Branch. I've been asked to come here today to brief you on the status of the staff's work on risk-based technical specifications.

We're in the early stages of evaluating the benefits that may be possible using technical specifications that are based on risk calculations. At the present time, the completion of the review of the new standard technical specifications and the lead plant technical specifications is the highest priority effort in the Technical Specifications Branch. Some studies have been done, however, and I'll discuss those later exploring the use of risk-

based technical specifications. And some applications of risk to technical specifications have already been implemented by the staff.

For example, the staff has approved nine topical reports on changes to the time that safety related instrumentation is allowed to be inoperable and to surveillance frequencies for this instrumentation. The changes proposed in these reports were based on risk calculations. The changes reviewed and approved in these reports are available to licensees as line item improvements; that is they can propose to make these changes independent of the new standard technical specifications. They're also included in the new standard technical specifications that are underway that are being worked on.

In addition, the staff has reviewed and approved individual changes over the last several years to technical specifications in which the basis for the approval was a reduction in risk.

Next slide, please. This figure illustrates the concept of controlling plant risk by adjusting the amount of time that a train or component of a system can be inoperable, which is the basic concept of risk-based technical specifications. The amount of time that a piece of equipment is

permitted to be inoperable before the operator has to take a remedial action is called the allowed outage time or AOT. The figure demonstrates risk as function of time that the component of a system is inoperable for two cases. In the first case on the left, the increase in risk due to the inoperability of the piece of equipment is large, relatively large. There aren't any numbers on the slide. In order to limit the total integrated risk, which is the area of the rectangle, the allowed outage time is short so that the condition isn't allowed to exist for a very long time.

In the second case, the increased risk due to inoperability of the equipment is relatively small so that the piece of equipment may be inoperable for a longer time and still result in the same total risk.

This example holds equally well if instead of talking about one piece of equipment, the simultaneous outage of several pieces of equipment causes the increase in risk. The concepts, therefore, are not limited to the inoperability of a single piece of equipment as in the current technical specifications. This provides the operator with a means to assess the overall risk of plant operation

rather than focusing on one system at a time.

There are several features of the risk-based technical specifications which make them attractive for further study that are illustrated on this feature. First, risk-based calculations provide a rational consistent bases for defining reaction times of technical specifications depending on the significance of the component.

Second, the operational flexibility is balanced against safety in an explicit clear way where safety allows the operational flexibility, which is reflected in the allowed outage time, the time allowed to restore an inoperable component can be increased.

And third, as I just mentioned, the concept can easily be applied to more than one component being out of service simultaneously.

And I'd like to illustrate these examples further with the next slide, please. This figure shows an example of a calculation of allowed outage times using risk for four pieces of safety related equipment. Remember the allowed outage time is the amount of time that the equipment can be inoperable before the operator's required to take an action. The allowed outage times calculated based on risk are

shown in the figure as vertical bars. Alongside each of these is another vertical bar which represents the allowed outage time of the current technical specifications for that piece of equipment. The risk-based allowed outage times are in black and the striped bars are the current allowed outage times.

The figure compares the allowed outage times calculated with risk to those in the current technical specifications.

You can see in three cases the risk allowed outage time is greater than the value in the current technical specifications. And in one case, it's less. In the current technical specifications the allowed outage times of the three safety related pumps; the motor driven emergency feed water pump, turbine driven emergency feed water pump and the low pressure injection pump, all have an allowed outage time according to the current tech specs of 72 hours. And in the risk-based approach, the safety significance of the pumps can be differentiated and the allowed outage times can be different.

Two of the pumps are auxiliary feed water pumps which provide water to the reactor to remove heat when the regular source of water isn't available. One pump is driven by an electric motor

and the other is driven by a turbine. The source of power for the pumps makes a big difference for some accidents, and you can see this in the difference in the allowed outage times for the two pumps in the risk calculations.

These examples illustrate how risk-based technical specifications are capable of providing an explicit rational approach to selecting allowed outage times. The approach works just as well in selecting surveillance intervals, surveillance frequency times, for a system or component.

COMMISSIONER REMICK: Question. On that comparison, your reference to risk, was this core damage frequency we're using as the comparison?

MR. LOBEL: Yes. Yes.

The risk-based approach isn't suited for all technical specifications. For example, some process variables like pressure and temperatures are not suitable to the risk approach. Some technical specifications would, therefore, remain the same. They remain in the present form even if risk-based technical specifications were adopted.

Next slide, please. In 1987 NRR initiated a project as part of the Technical Specification Improvement Program to study the application of risk

concepts to technical specifications. The two purposes for this program were to explore the effectiveness of the current technical specifications for limiting a plant's operational risk and to identify and develop alternative risk-based approaches that would more effectively control plant risk. The goal was to select one or more alternative approaches for potential trial application. This study was completed in 1988 and recommended a real time risk-based approach.

The real time risk-based approach utilizes a risk model for the plant, which is programmed in such a way that it's interactive with the user. That is, a person can input a plant specific equipment configuration and in a matter of only a few minutes he can obtain an estimate of the changing risk over the baseline risk value. Because the system's interactive in real time, it can be placed in the control room to directly advise operators of the plant risk of operation in the current configuration.

The real time risk model can use the most comprehensive risk model available. It's not necessary to use a smaller, less complete version.

Increases in plant risk are directly linked to the unavailability of plant equipment. The effect

on risk of mobile equipment outages can be easily determined.

It's important to note that the user doesn't need to have any knowledge of risk assessment. The instructions issued to the user from the computer will be in terms of specific actions for specific systems, not core melt frequencies or similar numbers.

COMMISSIONER REMICK: The risk model that you would use in this, would this be a level one PRA or is there another model that you would use?

MR. LOBEL: It would be based on a level one PRA with some revisions to the software to make it work in real time, make it interactive in real time. But it would be based on a level one PRA.

Now, this is preliminary. We haven't made any decision that it would be based on one level or another. But that's the thinking right now.

COMMISSIONER REMICK: Right. But your reference to risk model, you were using level one?

MR. LOBEL: That's right. If you limit it to a level one, you might limit the amount of technical specifications that it could be applied to.

COMMISSIONER REMICK: That was another question I had, what about containment systems.

MR. LOBEL: Right. Right.

The 1987 study identified a primary issue for further investigation as the practicality of implementation. A study was initiated in 1988 to continue and expand this work and in particular to address the implementation issues. It was to study the feasibility of a pilot program in which the real time system would be set up at a nuclear power plant to be run in parallel with the existing technical specifications. The existing technical specifications would, of course, still be governing but the real time system would be used to find situations in which even though the technical specifications were satisfied, the risk was much higher than the baseline value. And also to find situations in which plant action was required by the technical specifications even though the effect on risk might be small.

The characteristics that such a system must have would be identified and the effectiveness of such a system would be studied by looking for cases where the technical specifications would give actions that would be different than the results of this risk calculation.

And a final goal of this effort, an

important goal, was to obtain industry participation and input. A few members of the utility industry who we knew were interested in the concept became members of a working group which was established to study the issue. The utility members used their plant risk models in this program to evaluate actual plant situations for which the real time system would have been helpful. There may very well be other utilities who have similar programs and a future goal of our work is to try to identify and broaden the industry involvement.

The 1988 feasibility study is now complete. The results of this study show that it would be feasible to install a pilot risk-based system at a commercial nuclear power plant. No technical, economic or institutional issues were identified which would preclude the installation of the pilot real time system. The system would enable the NRC and the industry to assess the characteristics and effectiveness of the risk-based approach to technical specifications on a pilot basis.

Next slide, please. Now that I've described a little bit of the work the NRC staff has done, I'd like to talk about and describe some of the work that the U.S. industry has done and then some

foreign efforts in this area.

So far I've discussed applying risk to technical specifications requirements. Even with the current technical specifications, the risk concept can be applied to the management of equipment outages. For example, for performing testing and maintenance in a way that minimizes risk. Both Philadelphia Electric and Southern California Edison have programs that use risk analysis as a guidance in the scheduling of equipment outages so that the increase in risk is minimized during maintenance and testing. These are voluntarily efforts by these utilities to operate in the manner that minimizes risk.

In both cases, risk engineers at the utility have input into the scheduling of equipment outages. The technical specifications are always governing and are only supplemented by these programs.

Pacific Gas and Electric Company is the program manager for an EPRI program, which is a three tiered effort. The purpose of this program is to develop an approach, methods and a computer based system for implementing risk-based technical specifications. The first two tiers of the program

would involve changes to existing technical specifications which can be justified in terms of risk. The third tier would be equivalent to what I've been calling a real time risk-based system. In the EPRI project it's called the interactive risk advisor. It would be used by the operator to limit the risk of operation with components inoperable.

The description of this process by the participants stresses that "integral to this process is the interaction with the efforts of the NRC staff," and that also, "considerable interaction is expected with the NRC staff."

We hope to use this interaction as a method of focusing on detailed implementation issues related to the acceptability of risk-based tech specs from the licensing or regulatory viewpoint. Since this is an industry effort, our participation depends entirely on the progress made on the project by the industry group and the extent that they invite our participation.

Next side, please. Let me now discuss two significant foreign efforts related to risk-based technical specifications. We've already mentioned Heysham. Heysham is an advanced gas cooled reactor in England. It uses a computerized risk-based system in

place of traditional technical specifications for many of the heat removal and essential electrical systems. The system is called the Essential Systems Status Monitor or ESSM.

The British recognize that their deterministic technical specifications with written fixed rules were very conservative and were limiting the availability of British gas cooled reactors. So work was begun in the early 1980s on a risk-based system to replace the traditional technical specifications. The system that was developed was installed at Heysham 2 in 1987. The results of the ESSM probabilistic assessments are displayed to the operators as so-called maintenance categories. Each maintenance category corresponds to a range of probabilities of core damage. The operator's actions depend on which maintenance category the plan is in.

In addition, there are deterministic rules that they call "backstop rules" which must always be satisfied. If they're not satisfied, the reactor must shutdown.

Off-line modules of the Heysham 2 ESSM can be accessed outside the central control room by personnel, planning, maintenance and testing. This allows maintenance personnel to assess the effect of

regulatory issues which have been identified for risk-based technical specifications. I've listed them on the viewgraph and I'd like to go through them briefly.

We looked at the regulation that governs technical specifications to see if the use of risk-based technical specifications would be consistent with the regulation. Section 50.36 of the Code of Federal Regulations requires each licensee to have technical specifications for the facility and specifies the contents of the technical specifications. It also specifies that the technical specifications will be derived from analyses included in the safety analysis report. These are design basis calculations.

The risk-based approach may not meet this requirement since risk calculations go beyond design basis calculations. And we have to investigate this further.

The current safety analyses, which are the basis of the current technical specifications, use criteria such as fuel rod temperatures and reactor coolant system pressures for success/failure criteria. These criteria generally contain a large margin of safety. Risk calculations are, in general,

more best estimate. Therefore, the new risk related criteria suitable for risk analyses must be developed and used for risk-based technical specifications.

These would probably be similar to criteria already used in probabilistic risk analyses and so this shouldn't be a major effort.

There should be regulatory requirements for the criteria for operator action. In the British ESSM, the actions an operator takes are, in a very general way, determined by the magnitude of the increase in risk. If the risk increased due to a change in the status of a system is small enough, the operator may not have to take any actions at all. On the other hand, for a situation that has a relatively high risk associated with it, the operator has to take prompt action. The NRC would have to develop or approve similar criteria for use in a U.S. system.

From a regulatory viewpoint, configuration control is important. A risk calculational model used for technical specifications would probably not be allowed to be changed without NRC approval. On the other hand, the models must be updated as the design of the plan is modified to assure that the risk-based system accurately models the plan. Therefore, a system of controls to satisfy these

planned outages on the plant risk. What-if scenarios can be run and optimum maintenance activities can be planned.

ESSM also gives the operator a choice of what actions to take to reduce risk in a given situation by identifying options that the operator can take to restore which piece of equipment he should restore to operable status first.

The Nordic countries also have a program to apply risk techniques to technical specifications issues. One aspect of their work, which is of particular interest to us, is a study they're doing of the risk of shutting down a reactor. Because so many systems have to work properly to shutdown a reactor; to stop the fission reaction and reduce the temperature and pressure, shutting down a reactor inherently has some risk associated with it. In order to effectively optimize the risk reduction, the risk of continued operation in a given configuration must be balanced against the risk of shutting the reactor down. That is, the Nordic countries are asking is it safer to let the reactor run or to shut it down with certain equipment inoperable? We're following this work closely.

Next slide, please. There are several

somewhat conflicting goals has to be developed.

Access to the computer model used by the utility must be controlled by the utility in order to assure that the risk model approved by the NRC cannot be changed except in an authorized way. The British go to some trouble to assure this with ESSM.

The technical adequacy of the risk analyses is another important issue and the staff will want to have some input. The risk model itself must, obviously, be accurate and complete. As many systems interactions as possible should be modeled. Human factors considerations must also be modeled. The failure data that are used must be applicable to the specific plant. And uncertainty in the risk analysis must also be included.

A final thought which I know is not just a regulatory issue but also a concern to utilities, is that the risk advisor must not be used by the operators as a black box. That is, it must not exclude operator judgment and assessment of the plant status. No computer program ever models reality perfectly, so the operator's judgment is always necessary. Any system of the type which is actually used in place of written technical specifications has to take this into account.

Next slide, please. Finally, we see the role for the NRC staff in risk-based technical specifications in the near future as rather limited due to our present available resources and priority of other technical specifications work. We will, essentially, monitor industry programs and foreign efforts. We will participate in discussions with the industry to provide a regulatory prospective to industry work on risk-based technical specifications. I believe the industry expects and welcomes this.

Most present industry effort appears to be directed to outage and maintenance planning, which doesn't require direct NRC involvement. That is, prior review and approval. Therefore, no NRC action in the near future is necessary.

It appears that our efforts to date have been successful in encouraging the industry in the direction of risk-based operating rules and we hope to continue to encourage this work in the future, since it appears to hold great promise for increasing safety and operational flexibility.

That ends my presentation. Are there any questions?

MR. TAYLOR: Tom Murley, I believe, would like to --

DOCTOR MURLEY: Yes. I want to add a bit. It had occurred to me during Richard's presentation that there is an application for future reactors, and I think Commissioner Rogers asked this at an earlier briefing, where we will be more proactive. Although we can use this risk-based procedures for operating reactors, I think it's best done in the initial design stage when we know what's in the designer's mind; why he designed the system the way he did. And so for that reason I think this will have its probably near term application in the U.S., at least, in the evolutionary reactor designs.

We have notified the designers, in this case it would be GE and Combustion Engineering, that we expect them to develop a reliability assurance program, that we haven't defined it in detail other than a fairly highly level of extraction which means that we expect the safety that's designed into the plant at day one to be maintained for the full life of the plant. And we're going to do that through the use of tech specs, through the use of surveillance procedures and in-service inspection, in-service testing and maintenance program, and that sort of thing. We haven't got into the details of specifying what we want because we're kind of in an iterative

stage now with the designers. But I think probably the best application in the near term will be for these evolutionary plants.

I just wanted to mention that because it dawned on me during the presentation that we hadn't mentioned that in the briefing.

CHAIRMAN CARR: Commissioner?

COMMISSIONER REMICK: Tom, you said evolutionary, but I assume you're not ruling out advanced.

DOCTOR MURLEY: No. But we're further away on the passive and advanced, I think, than we are in the evolutionary.

COMMISSIONER REMICK: How about the case of the U.K., their ESSM, are they attempting to model human factor considerations into their risk model?

MR. LOBEL: They are to a certain extent, yes.

COMMISSIONER REMICK: To the extent we do or do you know?

MR. LOBEL: I'm not familiar with the details. I can't answer that.

COMMISSIONER REMICK: As I understand, you look at the change in the risk or core damage frequency, in this case. What do they use as the

base, the actual calculation based on the level one PRA as a reference or base point?

MR. LOBEL: Yes, they use a base model that considers all the equipment to be available. The difference would be from a model that would be done for predictive calculations that they assume all the equipment to be available for their baseline value. And then as equipment is taken out, that gives them their increase in risk.

COMMISSIONER REMICK: Well, that leads into the next question I had; available for what? Based on the example given in the report, it looks like you're using a full year, something like 8,000 hours or something like that. Is that what they do? They assume that in the ideal case the equipment is available the entire year? Is it 365 days or they assume some kind of a availability factor?

MR. LOBEL: Well, there's two things that they do for their basic model, and that would just be an instantaneous model. But then they also have a goal that they meet, I think they call it a cumulative outage factor, which they trend equipment outages and the increase in risk and they compare that with a number that was the basis for their PRA. And that number, theoretically, should come out close

to the number that was assumed in their PRA. And when we visited them and talked about this, their number was fairly close for the first year of operation.

So in their base model they don't look at cumulative, they look at instantaneous risk calculations. But then they have a way of trending so they can look back and see how well they did. And they can do this over a quarter or over a year. I believe the data they showed us was for both year and a quarter.

COMMISSIONER REMICK: You may have answered my question. Maybe I didn't understand, but you were basically saying that the area of the rectangle, the change in risk kinds of time must be the same.

MR. LOBEL: Yes.

COMMISSIONER REMICK: And in the base case what time are they assuming?

MR. LOBEL: In the base case you don't have any equipment out of service.

COMMISSIONER REMICK: Right.

MR. LOBEL: So you don't have any allowed outage times. All the equipment is assumed to be available and that gives you the lowest risk number

because all your equipment is there to vacate any event.

COMMISSIONER REMICK: Right.

MR. LOBEL: Then when equipment is taken out of service, the operator enters that into his module in the control room and the answer he gets back is a maintenance category which has done that calculation. My example is much simplified, but it's essentially calculated the area of the rectangle for him. And the number he sees is a maintenance category, normal maintenance, urgent maintenance, whatever the category.

COMMISSIONER REMICK: I see. I see.

What kind of reaction have you gotten so far from industry, the ones who volunteered to participate? Have you had enough experience to get any kind of reaction yet?

MR. LOBEL: I think they're interested. I don't want to overstate their interest. I think they're interested, they want to proceed. Like I said in the talk, some of them are using risk in other ways other than this risk calculator in the control room.

I think they're understandably cautious about making something like this available to their

operators. I'm not sure that I've heard a whole lot of talk that they're enthusiastic about doing that at this point. That would be one of the evolutionary things that would have to come from this. But I think they're definitely interested.

They're interested in ways that they can use this as guidance for minimizing risk, whether it's in the control room or not in the control room. Most of the advantages of this can be had without putting it in the control room because it's not an emergency thing the operator needs to respond to an emergency with. He can do this in some reasonable time. He can go to another room or call another group and ask them, you know, say, "I'm in this configuration. What should I do about it?" You know, "What's the advice I should get from this system?"

COMMISSIONER CURTISS: You said they were reluctant to give it to their operators. Actually, one of the questions that I've had, this system gives the operators a great deal more latitude and judgment in exercising their day-to-day decisions. Have you gotten a feel from the pilot plants that pursued it whether the operators liked the system, liked the judgment that they get or prefer the black and white

nature of the current tech specs?

MR. LOBEL: I haven't talked to operations people. Really, I think it's other people at the utilities that we've been talking to. I'm not sure I could give a real good answer to what the operators themselves think about it.

CHAIRMAN CARR: I doesn't sound like it's that far along. I don't think it is.

MR. LOBEL: No.

DOCTOR MURLEY: My understanding from my staff who have been to Heysham, and maybe some of you have heard the same thing, that talking with the plant manager and the operators there, they do find it useful and they understand it, and they do appreciate the latitude that it gives them. It gives them better understanding of outage times.

Bill mentioned that he and I and a couple of other on our staff will be there in June and we intend to pursue just these kinds of things.

MR. LOBEL: When we talked to the British when I was there, they were very enthusiastic about it and their operators did like it and glad to have the flexibility. The planning people, also, were very happy to have this system. It helped them to do their planning in a more rational, thought out way.

They could plan outages in a way where they could still get all their work done, but minimize the risk to the plant and public.

COMMISSIONER REMICK: I assume that since tech specs are a part of design certification that none of the evolutionary plant design certification applications in-house is proposing anything like this yet?

DOCTOR MURLEY: No, they're not. But we haven't gotten to the stage of talking with them what we want and what they're going to propose in terms of this reliability assurance program. We've told them that we do want to see the tech specs as part of the certification, but also the maintenance program, the surveillance program, the in-service inspection and testing.

I view that whole collection of programs as essentially a reliability assurance program. And so risk-based tech specs may very well be the most logical way to go. I think we're going to promote that. The only trouble is I don't know how advanced and how comfortable the designers feel with that approach. The logic is inescapable, it seems to me.

COMMISSIONER REMICK: I agree. I did not know about this program, but I found it extremely

interesting to read about.

That's all, Mr. Chairman.

CHAIRMAN CARR: Commissioner Rogers?

COMMISSIONER ROGERS: Well, I think it's a very interesting program. I was at Heysham. I could just say that I looked at some of my notes from that visit and, just very briefly without extending this meeting, that model gives operators a very rapid set of answers and they're told whether a deterministic criteria would require immediate remedial action or whether a probabilistic criteria would require immediate remedial action, so it does both. And applying probabilistic criteria whether there would be a plant reconfiguration warranted within 36 hours or whether no short term action is required, so they get out of that.

I know they find it very useful and I think it's used on a day-by-day basis in running Heysham as part of their whole style of operation.

I had a couple of questions. How does the accident sequence precursor study, how would that be used in this pilot program? Do you know in detail how that would be used?

MR. LOBEL: I don't think we've gotten to the point where anything has been thought out as to

details at this time.

COMMISSIONER ROGERS: Well, I was just looking at the report, this report that just came out on March 29th from Science Applications, 91033, and they mentioned in there that that's part of the process analysis, and I just was a little curious as to how that worked.

MR. LOBEL: Well, one thing you could do with this before you ever got to a risk-based system is you can get a lot of good information as a plant operator on how best to operate the minimized risk without having any system like this based on PRA studies that are being done now. And I think that would factor into operations at this point.

The system that I was talking about was kind of the ultimate system. It would be an interactive system right in the control room and, like I said before, you really don't need to go that far to get a lot of benefits from this. And you could back off even from having a computer system and just have a set of rules that were based on your knowledge of the results of your plant PRA.

COMMISSIONER ROGERS: Well, is there any thinking here in using this approach other than ordinary operations? For example, we know that the

outage times are ones that have certain vulnerabilities. We're just discovering that, you know, we see it keep popping up at Calvert Cliffs and Vogtle and things that one has to be worried about during mid-loop activities. I wonder if this might not be a good place to think about applying this, because that's something that people seem to have, more or less, relaxed on that when the reactor's down, it's safe. Well, it isn't necessarily safe. I mean, it depends on what you do. And this is one area of application, I think, that might be well worth looking at because it seems as if it's an area ripe for fresh attention, let's put it that way.

MR. LOBEL: Well, we're trying to include the lessons we learned from these things in the new standard technical specifications. And to the extent that lessons come up that are important enough, they'll be factored into guidance to operating plants, too. But we're trying to take the information that we get. Our Probability and Risk Branch has been looking at things related to technical specifications and we talked with them and try to factor all this into the new standard technical specifications.

DOCTOR MURLEY: There's something to add to

that. The same techniques that you would use to display risk in real time, say, to an operator are the same techniques that we could use to develop allowable outage times and surveillance intervals and that sort of thing. In fact, that has been done to some extent in the past. And we will be using those.

Now, you're quite right that we still find things, I guess, we didn't fully appreciate it in the tech specs. There is this feeling that once you're in mode 5 that things are all right and there is a relaxation at the plant. That's become probably my number one or two concern these days.

You recall in mid-loop operation we sent out not only a generic letter to each licensee, but I personally sent a copy to each operator and told them of the concerns of shutdown operation.

Bill Russell is going to be looking at this area. He's going to pull together all these issues, because Vogtle has taught us some things, other operations, other events have taught us some things. And we're going to be looking at this whole question of shutdown safety and whether we need to look at our tech specs.

You also mentioned the accident sequence precursor program. That generally is a backward

looking program. That is, it looks at the experience in the past and then asks what was the risk at the time. It's an important program and I've asked the staff with AEOD to pull together a briefing. I think we're still probably a month or two away from that, but we'll come down to the Commission with a briefing on that because it's a very important program.

COMMISSIONER ROGERS: Well, I understand from the contractor's report that this is an important part of the pilot study, that part of the actual conduct of that pilot program would involve comparisons using that information the --

DOCTOR MURLEY: Yes. They could use actual data to test how --

COMMISSIONER ROGERS: Right. Right.

DOCTOR MURLEY: I see. Yes.

COMMISSIONER ROGERS: The statement here is that you look at the plant configuration change data and these are then used by each utility in their plant specific PRA to calculate the corresponding changes in plant core melt frequency. This information, combined with an analysis of the results of the accident sequence precursor study form the basis for some insights about the effected current tech specs on plant operational risk. So we've got

it integrated in there and I was just curious as to how they were doing that.

I would think that this multiple component out of service thing is very important and how one chooses those. You know, how many layers down? Two, three? How many components would it consider might be out at any one time in one of these studies. And the application of it to the outage periods would seem to me would be well worth putting some real effort into it.

The costs that are suggested in this contractor study are not negligible, but they are not overwhelming if those estimates are correct. I was wondering if you'd had any thought about whether the cost estimates of implementing this, both by the licensees and the NRC particularly using the real time approach, are at all realistic?

MR. LOBEL: Well, we've just gotten that report and, hopefully, we'll get some comments from the people in the industry and they're the ones that can best tell us how realistic those costs are.

COMMISSIONER ROGERS: Oh, for them. But for also for NRC?

MR. LOBEL: For us?

COMMISSIONER ROGERS: Yes, also for you?

MR. LOBEL: My opinion, I think they're probably very good estimates as far as the NRC costs.

COMMISSIONER ROGERS: Well, I'd just like to say that, you know, my own personal view is that this is a very important program and it's well worth looking at very hard. It is an approach that there are a number of questions about and, you know, we have to probe those. But at first blush it looks very promising. And certainly the experience of the British and others suggest that it is a practical tool that can be used.

CHAIRMAN CARR: Commissioner Curtiss?

COMMISSIONER CURTISS: Just let me add one voice, I guess, to what was said earlier by Commissioner Rogers and Commissioner Remick. There are a number of things about this program that are attractive to me personally, including the focus on risk and the integration of the PRA into a utility's operation where the actual results of the PRA get plugged into the day-to-day operation of a facility.

Let me focus just for a minute on a subject not within the four corners of risk-based tech specs. But in reading the material for this briefing and in talking to the folks at Southern Cal Edison earlier this year when Commissioner Rogers and I had a chance

to go out West, one of the things that occurred to me is that a real advantage of this program is that it tells you in terms of timing when it's best to conduct the surveillances and when it's best not to, and when it's best to conduct your maintenance and when it's best not to.

Question: Has any thought been given to whether this basic approach would provide an avenue for us to focus on a broader application of the risk-based principle in the maintenance context generally so that rather than focusing here just on when you should and shouldn't conduct the surveillance, when your systems are in the right alignment that would permit you to conduct the surveillance with the lowest possible risk, or the maintenance? Couple that principle with a risk-based approach that would focus on frequency; not just when it's appropriate to but how often and how frequently you should conduct your surveillances and your maintenance. Is what we're learning here presenting us with an opportunity to infuse this principle of risk-based focus in the maintenance of the plant in a broader way in the maintenance area generally? Can you speak to that?

MR. LOBEL: Yes. I hate to keep going back to it, but this is still very preliminary.

COMMISSIONER CURTISS: I understand that.

MR. LOBEL: But we've talked about that. We've talked about using it and, in fact, as I mentioned in the talk a little, there are other uses without getting in the technical specifications, and that would be an ideal one. And we've talked about the concept of doing that. And that could even be a first application.

We haven't talked to the extent that the NRC would get involved in encouraging it. Utilities can use that approach without approval from us as long they're following their technical specifications. Within a surveillance interval they can choose, you know, when is the best time or how many to do simultaneously and that kind of thing.

As far as the effectiveness of maintenance, if I was understanding what you were saying, I'm not sure that it would be effective for that. This is just my own opinion. But I'm not sure it would be that effective in telling you the effectiveness of maintenance because it would be hard to get enough data to feed that back into the risk model to see the improvement in there. I think you'd probably have to depend on other measures of the effectiveness of the maintenance. This would just tell you in terms of

risk when it would be best to do it.

COMMISSIONER ROGERS: Well, I don't know. Why couldn't you couple the reliability data, actual hard reliability data, with this and --

MR. LOBEL: Theoretically you could. There's no reason why you couldn't.

COMMISSIONER ROGERS: Holds it together and give you a running risk element.

MR. LOBEL: The problem is getting enough plant specific data that you could feed into the model. But theoretically, there's no reason why you couldn't do it.

MR. RUSSELL: Let me comment, just for a minute, because that's in essence the approach that's taken if you look at, as Heysham does, how close do they come at the end of the year or the end of the quarter to the model that was built into the PRA. And so while you're looking instantaneously to help you make decisions now as to when's the best time to perform the surveillance or is it appropriate to have a longer schedule or a shorter schedule for performing a particular maintenance activity, you collect that data and you look at that at the end of the year to see how close you came to the model. So there clearly is a relationship between what I would

characterize as a reliability centered maintenance program where your objective is to maintain an availability or a reliability of a system because that's indeed what you've modeled. And so you have, if you're comparing what your experience was to where you are in that model on an integrated basis, you are, in fact, judging how well you have done in meeting that. And so then you get to things like time to repair the availability of your spare parts and components. If you did it in a shorter time, that clearly effects availability. And you're actually keeping book of what your history has been and how close you are to the model.

So in that context the two are related. But we're very early in the discussions, and this is one issue that I wish to explore with the British while we're there. We need to discuss it ourselves, but clearly they are related activities.

COMMISSIONER ROGERS: Well, the whole technique and the technology of doing this, it seems to me, has various ways in which you can shade it and use it. And while it happens to be coming now to us under the rubric of risk-based tech specs, what's supporting that whole thing has many, many different ways of being used. It's a tool. The tool can be

used in a variety of ways. I think that we ought to be looking at those possible applications, not necessarily to engage in them ourselves, but we ought to be well aware of that and not simply look to see how this can be used on tech specs. That's one possible way. I think the relationship with maintenance, I think, is one that's well worth looking at. Well worth looking at.

DOCTOR MURLEY: There's a far broader, I think -- what we're getting at here ultimately is the pushing out of the risk-based insights that we've gotten down to the operating staff in a plant. Initially, if a utility did a PRA at all, it was at their engineering headquarters and they'd do it and it would sit on the shelf and gather dust, generally. We've been pushing it, as you know, and now we're getting more and more of the staffs involved. But what we're talking about here is a far broader application of PRA.

COMMISSIONER ROGERS: Right.

DOCTOR MURLEY: And quite frankly, I think that's where the agency ought to be putting its effort in the future. I think we've gone about as far as we can go in refining our models and cutting, you know, whether such-and-such a risk number is

exactly right. I think there's enough insights now that we ought to be pushing this emphasis.

COMMISSIONER ROGERS: And, in a way, it's looking at a way of testing engineering judgments.

DOCTOR MURLEY: Yes.

COMMISSIONER ROGERS: I mean, engineering judgments are the best that can be done at the time. And then the question is, well, you know, let's review those issues in some ways because we know that traditionally engineering judgments have been very conservative and you do the best job you can on a design and then you multiple everything by a factor of 10. I think it's, you know, you're covered. And I think that one could very well look at some of those things and visit them and this is the tool to do it with. Not a perfect tool. I mean, I'm not unaware of its limitations, but it's still a new tool.

MR. TAYLOR: And it increases the attractiveness to the utilities themselves to try to look at this as we proceed here, not just in NRC, but to the utility to --

COMMISSIONER CURTISS: It does seem to me that I do think the utilities, particularly from the standpoint of their pursuant of the risk-based tech spec program for the existing reactors are probably,

from what you've described here, going to do this on their own motion if they're going to do it. But it does seem to me that one of the immediate opportunities that we have to do the kind of things that Doctor Murley is talking about is before us right now with the maintenance initiative where we've gotten now considerable information, at least we've had a lot of reactor years. Whether the utilities have actually been collecting the data on systems or components remains to be seen. But perhaps with some encouragement from the Commission -- it seems to me the corrolary here is that what you're saying in the tech spec area is that we have a set of tech specs that are based, by in large, on engineering judgment. And as we take the risk prospective and focus on the tech specs, we're learning things like this system is permitted to be out of operation too long from a risk standpoint. The LCO is 72 hours where a system that is much more important may be permitted to be out of operation for a much longer period of time.

I'd like to take a look here in more detail at what you have. I'll be anxious to see what you come back with when you go to the Heysham plant in Great Britain. But it does seem to me that this is an opportunity to take a look at what, not only this

industry but others like the airline industry have done in the risk area and to begin focusing in the PRA context with a particular initiative like maintenance where, I think what we're saying here for tech specs is, we're interested in the result, in the risk-based result and it's apparent now from the standpoint of the tech specs that some cases we may not be achieving the result that risk would drive us in the direction of saying we'd like to see. In a very similar way, I guess I just toss out for your thought from here on out, the notion of extending this principle now and using this as a point of departure for potential application in the maintenance area. I don't have any firm suggestions to make at this point, but it's an intriguing notion to me.

Let me ask you a couple of specific questions. On the international front, I recall at the last meeting the Rumanians were looking at applying this principle to their next generation of reactors. Is there any advancement on that front or is that still on the fire?

MR. LOBEL: I'm not familiar with that. And with conditions the way they are now, I'm not really sure that that would be continuing now. I'm

not really sure what the Rumanians are doing.

COMMISSIONER CURTISS: Okay.

Tom, on the timing of the implementation of this concept for the advance reactors, you focused on the evolutionary reactors and GE and CE in that order, can you give me a feel, and I realize you're going through the preliminary discussions here on what a reliability program would look like in areas beyond just this particular one, in view of the schedule that we're talking about here, can you give me a feel for when you would expect to reach some kind of view on whether risk-based tech specs is something that we'd like to not only encourage but, perhaps, beyond that we would like to see as part of the application and submit it for design certification?

DOCTOR MURLEY: We don't have firm times when we would be dealing with this. We've highlighted this whole issue of the reliability assurance program to the applicants. I think it was about a year ago. Sometime last spring of '89. At the time, we didn't have any details and we still don't, as a matter of fact, on what we want to see. But we thought we'd get them thinking because they're the ones that they know what we want, generally, and

it's that abstract thought that I said that a program of maintenance, surveillance, tech specs and in-service testing and so forth that makes sure that, as near as we can, the safety of the plant doesn't degrade with time. Because we're going to license-- we could be certifying many of these plants. But in any case, it's a 60 year design and there could be many plants. So the idea was to build in as much as we could of assurance that the safety doesn't degrade once the plant starts.

And I think risk-based tech specs is going to be a part of that thinking. So, I would hope that probably sometime this summer we would ask both GE and Combustion what thinking they've done along these lines and we'd sit down and talk about their whole reliability assurance program.

COMMISSIONER CURTISS: Okay. That's all I have.

CHAIRMAN CARR: Well, at the risk of being a wet blanket, speaking of risk, I think we're spending a lot of time talking about apples and we're discussing apple blossoms. This program is just barely getting underway and the way I read it, the real concern I guess I've got with it is kind of hidden in the words there on page 29 that says, "The

easiest way to do this is for the NRC to develop specific guidance for different types of human error analysis and recovery action." And we have a hard time doing that, and with the amount of human error we've got in the program now, I don't know how much anybody's going to depend on these level one PRAs to take that into account. That's one problem I got.

The second one is, I don't know how much confidence we got in the current set of level one PRAs that we wouldn't have to go back and look at. I think your set of issues you've got have got tremendous number of problems in there when you start to flush them out.

Having said that, let me ask you a couple of questions. The cost estimates, I notice, are only for NRC and utility efforts. There's no way in the world, in my opinion, SAIC is going to come in with that nice a study without a lot of contractor manhours involved. And before they get through with this program, is somebody factoring in all those contractor hours?

MR. LOBEL: No, not at this point because we really haven't decided how to proceed with this.

CHAIRMAN CARR: Do you really have a feel for if we decide to use these level one PRAs, how

accurate and how valid we're going to require them to be and then how much control we're going to hold over that continually updated PRA?

MR. LOBEL: No. The issue's just been identified as one that needs to be looked into. When I first started working on this, that was one of my first questions about this issue was the accuracy of the PRA. And there's another issue, too, and that's the validity of the PRA. Even if it's doing the calculation perfectly, how do you know that -- you know, it isn't like doing an analytical calculation where you have a reduction in flow and you go out and stop pumps and measure against your calculation. I think there are a lot of issues that need to be addressed. It may be, though, that you can use this in a relative way where you don't have to have exact numbers, where you can just do comparisons.

CHAIRMAN CARR: My impression is while we're currently using it that way if we get a justification for continued operation beyond the limiting condition, everybody looks at it immediately and says, "Okay, what's the risk" and letting them go beyond what the tech specs say. And I assume we're doing that now when we approve those things, aren't we?

DOCTOR MURLEY: We base some of our thinking and our decisions on our insights from PRAs, yes.

CHAIRMAN CARR: Yes.

DOCTOR MURLEY: Let me just comment, Mr. Chairman, the PRAs themselves don't have to be absolutely accurate in terms of their bottom line numbers. We can still take the difference between a diesel generator being out for 12 hours and 16 hours and get an increment in the sensitivity of that to the risk. And that is a fairly good number. That is, the differences from one set to another set we find to be fairly reliable. It's where one tries to take a bottom line, kind of a risk number, and use it that we get very nervous.

CHAIRMAN CARR: That's not what worries me. What's worrying me is that human factor piece of the problem.

DOCTOR MURLEY: Yes. I think, by in large, the models have been developed to be fairly good over the years. The models of, like the sensitivity of a piece of a equipment or a system to overall risk. I'm pretty confident that we have a handle on that.

CHAIRMAN CARR: Are you confident of each plant's PRA that they've done. Some are older than

others?

DOCTOR MURLEY: No. No.

CHAIRMAN CARR: No. That's my concern on the PRA.

DOCTOR MURLEY: But the state-of-art is good enough, but not all plants are up to the state-of-the-art.

CHAIRMAN CARR: Yes.

MR. TAYLOR: You raised the same reservations I think about the PRAs, and that is we're much better at being able to work with the equipment issues than the human issues that sometimes enter into the risk.

COMMISSIONER ROGERS: If I could just pursue this a little bit. And that is, I'm sort of the impression that we don't understand the human factor elements in these PRAs. And maybe we take the point of view that there are --

CHAIRMAN CARR: They're not in there, are they?

COMMISSIONER ROGERS: Well, some. [illegible] But that the human factors effects are not very different -- maybe I'm putting it incorrectly but let's just put it this way anyhow -- that lack of knowledge tends to have one take the point of view

that since we don't know very much about the human factors effects that they're more or less equivalent in all situations and it would seem to me that, again, the same kind of analysis might reveal that human factors are much more important in certain situations than in others, as we know is the case. And that somehow one might be able to do some relative important guesstimates using this approach, folding in some human factors analysis. Again, you know, you're still not going to be looking at the bottom line, but you're going to look at relative importance of human factors in certain kinds of situations.

Now, we know how very important the operators are and things like that, but I'm thinking about other areas where we might get some insights on relative importance of human factors for different equipment and things.

DOCTOR MURLEY: Some studies, in fact, our research program as far back as ten years ago looked at the impact of various maintenance activities as well as control room activities on sequences of accidents within a PRA. This happened to be the Surry plant. From that, one can get sensitivity curves of risk. In this case it was core damage

frequency as a function of human error rate for various sequences. And one could then get the sensitivity of -- like, for example, it's fairly obvious, but a transient sequence is more important, more sensitive to human errors than one where -- like pressure vessel failure where it's just a single component has to fail.

So there are areas like that that have been done. But I think we have quite a bit more to do to really understand. And maybe it's not even possible, but to understand the kind of cognitive errors that operators can make. And by that I mean they have an idea in their head that something's wrong with the plant and it's the wrong mental picture of the plant. And they go out and they ignore everything else. And I don't know how you model something like that.

If you read again the Chernobyl event, I mean they clearly blocked out a lot of information that they shouldn't have. And how could anyone predict a sequence like that?

So I think there are limits to how far we can go. I'm not sure that was the question you were getting at, but we have to keep probing. And I think that's where our research program is heading.

MR. RUSSELL: Another piece related to your

comment is that the sensitivity studies you do in human reliability analysis are very model dependent. And they all seem to build on the same data that is somewhat dated that was gathered back in the late '50s. And so what you do by way of validating the model is a difficult question. And I'm not aware of activities going on to collect data to attempt to do model validation in the human error analysis areas. So you get some insights for a particular model.

COMMISSIONER ROGERS: Well, I thought that's what we were raising questions about when we heard about our human factors program, that there was a need to collect some more data. I mean, that that was one of the things where work had to be done.

MR. RUSSELL: That may very well be. I'm commenting based upon as I knew the program three and a half years ago when I was heavily involved in it. And I'm not aware of any work that's been done in that intervening time. Yes, the validation of the models and the data is a key issue if you're going to use it to make significant regulatory decisions.

COMMISSIONER REMICK: I will say as an engineer I would welcome the added insight from risk-based models realizing they're imperfect in making a judgment than not having that information available

to me in making that judgment.

CHAIRMAN CARR: There's no doubt about that. We all appreciate all the help we can get.

COMMISSIONER REMICK: Right. Sure do.

CHAIRMAN CARR: Has any licensee, even one of the three that was involved in this working effort so far, expressed an interest in volunteering for the pilot study?

MR. LOBEL: There's been some interest, yes. Nobody has volunteered per se, but people have expressed interest in it.

CHAIRMAN CARR: Well, one thing I know they like is stability in the regulatory process. They got a system there they know how to work with and they know what to do now, and trading that in for something that's kind of indefinite, it seems to me, would undoubtedly be one of their concerns. But, personally, I think the thing's got promise. You know, all those great things that I've worked towards ever since I've been around have always been just around the corner and it's just a great idea. I think that it's certainly worth pursuing.

Well, I thank the staff for updating the Commission on the status of the program. The concept and its proposed implementation show promise in terms

of better defining acceptable equipment, outage times and surveillance test intervals from a risk prospective. I do note, however, that staff and industry resource expenditures to develop and implement the program described seem considerable. I would caution the staff to carefully determine the potential benefits that may derive from this concept as the program evaluation continues.

Any of my fellow Commissioners have any additional comments? Thank you very much.

We stand adjourned.

(Whereupon, at 11:07 a.m. the briefing was adjourned.)

CERTIFICATE OF TRANSCRIBER

This is to certify that the attached events of a meeting of the United States Nuclear Regulatory Commission entitled:

TITLE OF MEETING: BRIEFING ON RISK-BASED RECHNICAL SPECIFICATION PROGRAM

PLACE OF MEETING: ROCKVILLE, MARYLAND

DATE OF MEETING: APRIL 13, 1990

were transcribed by me. I further certify that said transcription is accurate and complete, to the best of my ability, and that the transcript is a true and accurate record of the foregoing events.

Carol Lynch

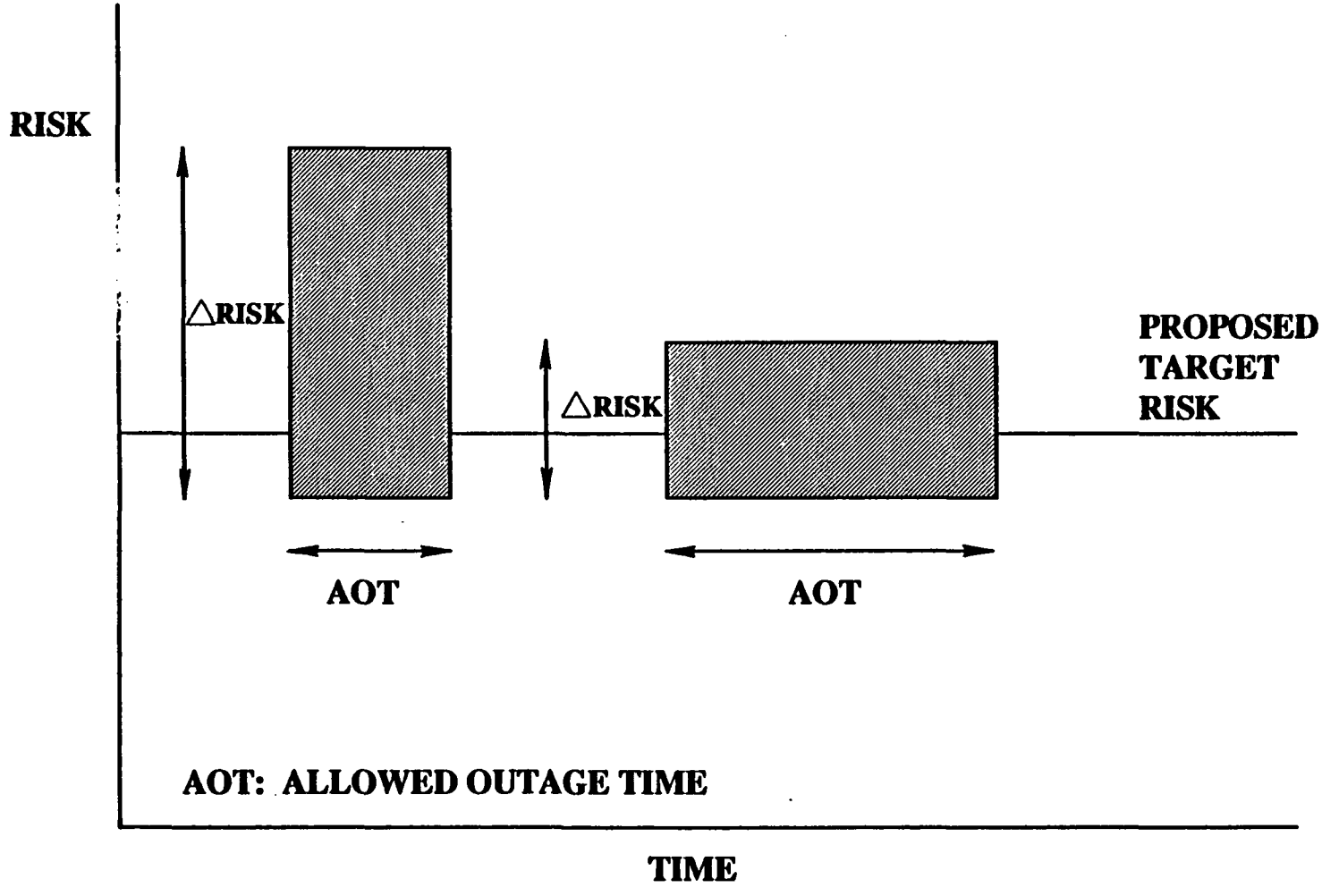
Reporter's name: Miles Anderson

RISK-BASED TECHNICAL SPECIFICATIONS

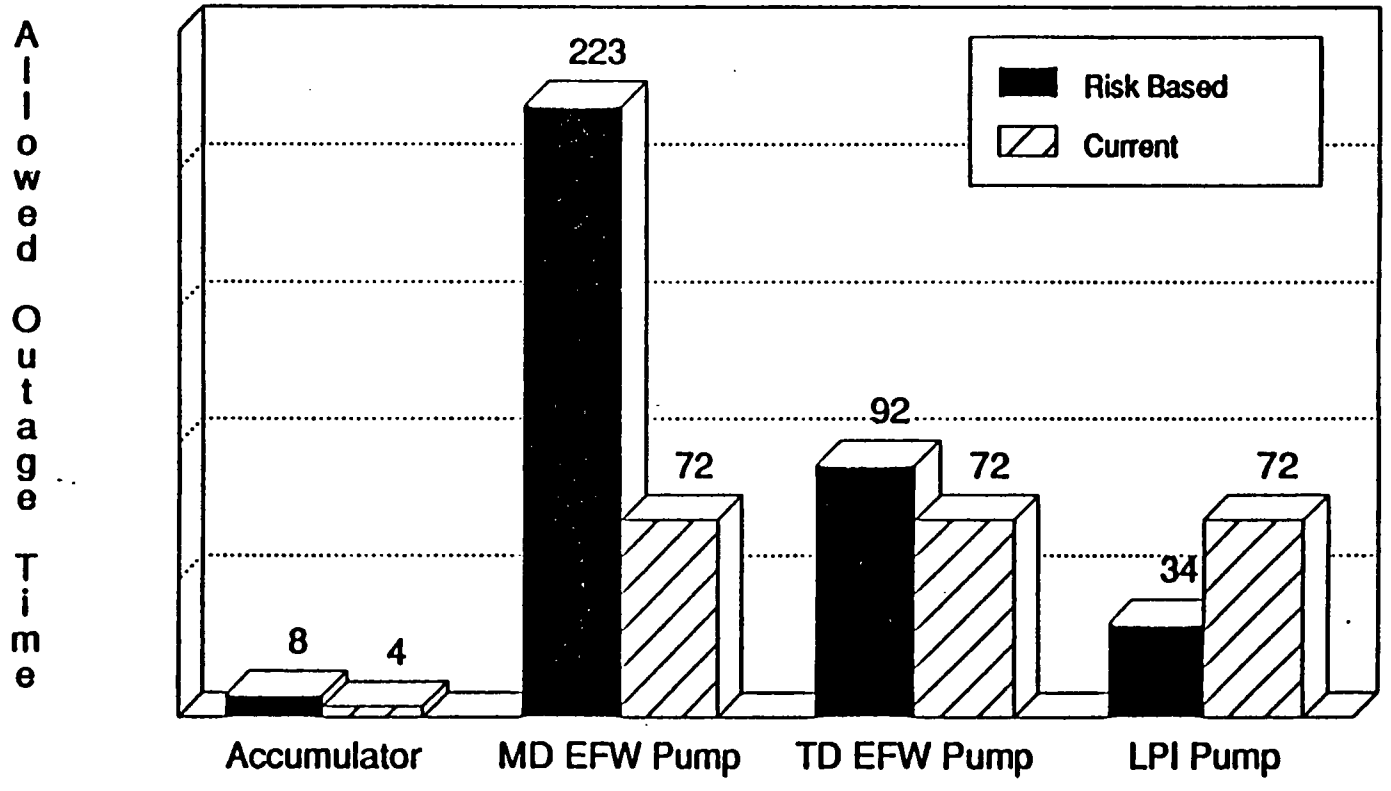
APRIL 13, 1990

RICHARD LOBEL

CONCEPT OF ADJUSTING AOTs TO CONTROL RISK



Risk-Based Technical Specifications
Allowed Outage Times (Hrs)



MD EFW = Motor Driven Emergency Feed
TD EFW = Turbine Driven Emergency Feed
LPI = Low Pressure Injection

NRC EFFORTS ON RISK-BASED TECHNICAL SPECIFICATIONS

- NRC Initiated Two Studies Of Risk-Based Technical Specifications
  - Best Approach (1987)
  - Feasibility Of A Pilot Program (1988)
- Real Time Approach Selected
  - Most Comprehensive And Rapid Assessment Of Instantaneous Plant Risk
- A Pilot Study Should Be Initiated At A Volunteer Utility To Address And Resolve Remaining Technical Issues
  - Gain Confidence About Ability To Minimize Plant Operational Risk

WORKING GROUP UTILITY MEMBER EFFORTS

- **Philadelphia Electric Company Uses The Limerick PRA To Enhance The Safety Of Plant Operation**

- **Southern California Edison Does Quarterly Monitoring Of Risk Profile**

- **EPRI/Westinghouse/Pacific Gas And Electric: Interactive Advisor**

FOREIGN EFFORTS

U.K. - Essential Systems Status Monitor (ESSM)

- **Heysham 2 Was Designed And Is Operated With Real Time Risk Analyzer (ESSM)**

Nordic Countries (Finland, Sweden)

- **Reconsideration Of Plant Shutdown Requirements When Failures Occur In Specific Safety Systems**

REGULATORY ISSUES

- New Interpretation Of 10 CFR 50.36
- Risk-Related Criteria Supplements Current Licensing Criteria
- Criteria For Operator Action In Terms Of Risk
- Configuration Control Of The Risk Model
- Controlled Access To Risk Model
- Adequacy of Base PRA

NRC ROLE

- Monitor And/Or Evaluate Industry Efforts
- Provide Guidance, As Requested, To Industry Programs
- Monitor Foreign Efforts
- Take Part in Foreign Information Exchange Activities (e.g., IAEA)