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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

Title: BRIEFING ON PROPOSED FINAL RULE ON STATION BLACKOUT
--PUBLIC MEETING--

Location: Washington, D.C.

Date: Thursday, March 31, 1988

Pages: 1 - 73

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D I S C L A I M E R

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

* * *

BRIEFING ON PROPOSED FINAL RULE ON

STATION BLACKOUT

* * *

PUBLIC MEETING

* * *

Nuclear Regulatory Commission

Room 1130

1717 H Street, N.W.

Washington, D.C.

March 31, 1988

The Commission met in open session, pursuant to notice, at 10:02 a.m., the Honorable LANDO W. ZECH, JR., Chairman of the Commission, presiding.

Commissioners Present:

LANDO W. ZECH, Chairman

THOMAS M. ROBERTS, Commissioner

FREDERICK M. BERNTHAL, Commissioner

KENNETH ROGERS, Commissioner

KENNETH M. CARR, Commissioner

Staff and presenters seated at table:

S. CHILK - SECY

V. STELLO - EDO

W. PARLER - OGC

T. SPEIS

W. MINNERS

A. SERKIZ

A THADANI

F. ROSA

Audience Speakers:

P. BARANOWSKY

A. RUBIN

R. BAER

P R O C E E D I N G S

CHAIRMAN ZECH: Good morning, ladies and gentlemen. Today the Commission will be briefed by our Offices of Research and Nuclear Reactor Regulations on a proposed rule to require that light-water reactors be capable of withstanding a station blackout for a specific period of time.

A station blackout is a total loss of both off-site power and on-site emergency AC power systems.

The proposed requirement is based on information developed under the Commission's study of unresolved safety issue A-44 of station blackout.

The Commission designated station blackout an unresolved safety issue in 1980, and studies were initiated to determine whether additional safety requirements were needed.

In March, 1986 a proposed rulemaking was published in the Federal Register. Based on the Staff analysis of comments received, the proposed rule has now been finalized and is ready to be issued subject to Commission approval.

During the Staff presentation, we would be interested in hearing about the revision to the regulatory backfit analysis and the associated

regulatory guide for a review standard for the acceptance of the specific blackout duration.

This is an information briefing. The Commission will not be voting on the final rule today. I understand that copies of the slides are available in the back of the room.

Do any of my fellow Commissioners wish to make any opening comments?

[No response.]

CHAIRMAN ZECH: If not, Mr. Stello, would you proceed, please.

MR. STELLO: Thank you, Mr. Chairman. In a moment I'll turn to Dr. Speis to begin the presentation and to introduce others here at the table with us today.

I thought I'd make a few points to begin with. Station blackout clearly has been with us for some time now, and it is an issue that has been recognized as a significant contributor to core risk. In fact, those plants which are the latest plants the Commission has done a fairly thorough analysis of risk presented in NUREG 1150 that the Commission is aware of, shows that even though the core melt frequencies are getting very low, the station blackout remains a dominant contributor to risk.

With that background, we are proposing that there are two approaches one can use to deal with station blackout. One approach is to show, depending on the sources of power and site specific issues, if you can cope with a station blackout for a specific period of time that's acceptable or, on the other hand, if you add additional sources of power to the site, that's also an acceptable approach.

What the Staff will be presenting is why we believe that's a correct way to go, and we are going to suggest to the Commission that we think because of the issue that is raised that station blackout, even when malfrequencies get to be low, remain a significant contributor to risk and there are other generic issues that could be resolved, in fact, if you had an additional source of power that the Staff suggest, then the Commission ought to say in its rule that those two options are there but it prefers that the solution of station blackout be by the addition of an additional power source to the site.

And we'll identify that in the briefing and have some particular words to suggest that Commission may wish to consider adding. I think it's an important consideration, and we'll get to it in a moment.

But that -- Dr. Speis, will you continue?

CHAIRMAN ZECH: All right. You may proceed. Thank you.

MR. SPEIS: Mr. Chairman, Commissioners, to my right I have Aleck Serkiz who has been the project manager of this issue who will participate in the discussion, questions and answers.

Next, Minners, he's from the Office of Resources, the Deputy Director of the Systems Division; and from the Office of Nuclear Reactor Regulation, we have Faust Rosa, Branch Chief of the Electric Systems Branch, and Mr. Thadani, the Assistant Director for Systems who'll give you the NRR presentation.

Let me start by giving you -- can I have the next viewgraph, please.

[Slide.]

MR. SPEIS: In this viewgraph, I give you, Mr. Chairman, the briefing that will give you the dates. We'll give you the briefing as Mr. Stello said, it's in two parts. The first part will deal with the development of the rule, the second part will address the implementation of the rule. That's the part that will be provided by the Office of Nuclear Reactor Regulation.

In my presentation, I will give you a summary and background of the issue, I will summarize the safety concerns associated with the blackout issue, I will summarize the findings that we have put together. We have been working on the this issue for the last three or four issues very extensively, as you know.

We'll discuss the proposed resolution. We will discuss the benefits of the alternate AC power source that Mr. Stello just mentioned to you which is the preferred way of going, and go into some more detail of the rule itself.

May I have the next viewgraph, please.

[Slide.]

MR. SPEIS: Here we provide a summary and some background of where we are coming from. As you said, Mr. Chairman, a station blackout was designated in a recent safety issue back in 1978. The issue has been studied extensively since that time.

The issue has its origin basically in operating experience and PRA studies, not only the NUREG 1150 studies, but mostly the studies that have been done have identified station blackout as a contributor to risk.

Operational experience has been an important

factor in pushing us in this direction that we'll be recommending to you today.

From 1968 to 1985 we had a large number of, something like more than 60 total loss of off-site power events of a few minutes duration up to some hours.

From 1976 to 1985, we had made hundreds of diesel generator failures during testing as well as actual demands.

And also from 1968 to 1985, we had the number of station blackouts precursors involving total loss of off-site power, most of them for a few minutes, power was able to be restored.

So there is enough operational experience that tells us that it's an important issue in addition to the PRA studies that have been mentioned.

The other thing that tells us that this issue is important is that it has severe consequences, potentially severe consequences. If you lose power, you have limited capability of removing core decay heat. And of course in most instances you lose completely containment decay heat removal.

We have found out that severe weather conditions are a major contributor to loss of

off-site power; such weather conditions as hurricanes, ice storms, tornados.

We have done extensive studies, as I said, involving the total population of nuclear power plants. These studies have been documented in NUREG 1032. From those studies, I have -- I'm sorry. I was jumping to the next viewgraph for some strange reason.

We had extensive interactions with the ACRS, with CRGR. The rule, as you said, Mr. Chairman, has gone out for public comment, and the appropriate comments have been incorporated.

We had extensive discussions with -- interactions with industry. NUMARC sponsored the working group composed of utility people as well as technical consultants. In fact they have put together a document which has been identified as NUMARC 8700 which provides the guidelines and technical basis for addressing plant capability to withstand station blackout.

We have reviewed this document, and we have found it acceptable with some exceptions which are noted in the Reg Guide which I will discuss shortly.

NUMARC has agreed with these exceptions and has commenced to conduct the workshops for utilities

to demonstrate the use of this document.

So it is our understanding that industry now agrees with the way we are going about to resolve this issue.

MR. STELLO: In fairness, I don't believe the industry is aware that we are suggesting the Commission add its preference. I don't believe they are aware of a particular issue before this meeting, at least that's my understanding. So the agreement does not include any preference that the Commission may have. They are not aware of it.

COMMISSIONER ROGERS: Are they in agreement with the Rule?

MR. STELLO: Everything except -- yes.

COMMISSIONER ROGERS: They are in agreement with the Rule?

MR. STELLO: Yes.

MR. SPEIS: With the two options. And of course one of the options is the alternate power source, and Mr. Stello is saying that is our preferred option.

So we are here today to recommend that you gentlemen approve the issuance of the final rule which would require all LWRs to be able to withstand a station blackout for a specified duration and

maintain core cooling during that period.

I will discuss later on what are the -- what is the specified rates and where it derives from.

Again the goal of this role is to reduce the frequencies of occurrence of core damage from station blackouts. We feel that if this rule is implemented it will reduce the contribution of station blackout to core dominance by at least a factor of ten on the average.

COMMISSIONER BERNTHAL: Let me ask a question about the fundamental assumption here with respect to risk from blackout.

Is that a deterministic number in the sense that you have not tried to carry out perhaps independently an emperical study to see whether that matches what might be a normally deterministic methodology, if you understand what I'm saying?

MR. SPEIS: I understand, yes.

COMMISSIONER BERNTHAL: There are enough events --

MR. SPEIS: Yes.

COMMISSIONER BERNTHAL: -- by now that --

MR. SPEIS: I think this issue, even without rates, we have enough statistics and we know enough about the consequences of station blackout to make us

probably propose the same thing.

But I think this is an ideal issue where we are able to compare the statistics and the deterministic analogies with safety goals, and more or less they've met both of them, okay, using a safety goal type of approach and using the experience, the operational experience, the deterministic analysis, consequence analysis, we're able to reach the same conclusions. So one re-inforces the other, basically.

So it's an ideal issue where the safety goal, in fact one will come in the future to discuss implementation of the safety goal, we'll give you this as an example of how one can go about implementing the safety goal.

COMMISSIONER BERNTHAL: So you've surveyed all of the station blackout events, or perhaps precursor station blackout events, and carried out a statical analysis of that --

MR. SPEIS: Yes.

COMMISSIONER BERNTHAL: -- independently of a calculation and deterministic procedure that of course we normally do for PRA?

MR. SPEIS: All of that is discussed in this NUREG that I mentioned earlier, 1037.

COMMISSIONER BERNTHAL: And the results are rather similar --

MR. SPEIS: Very similar.

COMMISSIONER BERNTHAL: -- and they both indicate that the severe core damage frequency, well, it says here 10 to the minus 4, 10 to the minus 6.

MR. SPEIS: Let's go to the next viewgraph so we'll address a little bit those numbers.

[Slide.]

MR. SPEIS: I'm sorry, I was racing ahead earlier in the core assembly information here, but let me -- I won't repeat the first one as Mr. Chairman mentioned what station blackout is all about.

Again the genesis of this issue is both the operational experience and the extensive PRAs. The potential is severe consequences involving limited decay heat removal as well as no containment heat removal; I mentioned the severe weather conditions.

Again from all the studies that we have done involving the total population of nuclear power plants, we have estimated the range of frequency of station blackout to be somewhere to be 10 to the minus 3 to 10 to the minus 5 per reactor year. That is station blackout.

Now the contribution of station blackout to the total core damage, has been estimated to be somewhere between 10 to the minus 4 and 10 to the minus 6.

And this is what I said earlier that the goal of the resolution is to reduce the frequency of station blackout contribution and hopefully this 10 to the minus 4 number will go to 10 to the minus 5, okay, so that is the goal.

COMMISSIONER BERNTHAL: I guess the thing that's bothering me a little bit is that you have a range of frequency of station blackout: Ten to minus 3, 10 to the minus 5. That means that for a population of a hundred reactors, we should only see one every ten years, right? And that seems like that's wildly out of sync with what we are really seeing.

MR. SPEIS: This is a complete station blackout. This is not loss of off-site power. Let's make sure, you know -- loss of off-site power in the average of the United States is something like .1 per year. This is a complete station blackout.

COMMISSIONER BERNTHAL: Okay. But you still say -- you believe that -- I mean in the most favorable case, the 10 to the minus 3 means that for

a population of 100, it should happen once every ten years. And you're saying that somewhere between once every ten years and once every thousand years --

MR. STELLO: Well, are you using 10 to the minus 3 as the measure of the sample in the industry? The range is 10 to the minus 3 to 10 to the minus 4 -- I mean 10 to the minus 5.

COMMISSIONER BERNTHAL: Yes.

MR. STELLO: The average of the plant is on the order of more like 10 to the minus 4.

COMMISSIONER BERNTHAL: Fine.

MR. STELLO: Okay. And with 100 plants --

COMMISSIONER BERNTHAL: Once every 100 years.

MR. STELLO: Once every 100, and if you look --

COMMISSIONER BERNTHAL: Which bolsters my point.

MR. SPEIS: We've had three or four so far in the total operational experience.

MR. STELLO: Which is consistent with that number.

MR. SPEIS: Which is 1500 to what, 1700 years?

MR. STELLO: About 1500 reactor years of

experience that you would have expected --

COMMISSIONER BERNTHAL: Worldwide?

MR. SPEIS: No. No. United States. United States.

COMMISSIONER BERNTHAL: United States?

MR. SPEIS: Yes.

MR. STELLO: So it's inconsistent with --

MR. SPEIS: It's consistent.

MR. STELLO: -- the numbers. The frequency range that you have, the rate is reasonably consistent with the experience that you've had.

COMMISSIONER BERNTHAL: How many actual station blackout events have we had?

MR. SPEIS: Okay. We have had four. I'm familiar with four of them. They are a few minutes. The longer one was the -- the other ones were a few minutes and we were able to restore -- I mean the plants were able to restore power.

COMMISSIONER BERNTHAL: So we've had four events in 1300 odd reactor years. That doesn't comport with these numbers. You're saying we have --

MR. STELLO: Yes.

COMMISSIONER BERNTHAL: -- four station blackout events.

MR. STELLO: Right.

COMMISSIONER BERNTHAL: 1300 operating reactor years.

MR. SPEIS: It's more than 13, it's 17.

MR. STELLO: About 1500.

COMMISSIONER BERNTHAL: Well, okay. 1500.

MR. STELLO: Right.

COMMISSIONER BERNTHAL: Let's say 1600, it makes it easy here. That means one in 400.

CHAIRMAN ZECH: You've got somebody here that wants to --

MR. BARANOWSKY: Could I clarify something. My name is Pat Baranowsky and I'm the author of the report that everybody is discussing the statistics on.

The 10 to the minus 3 number is based on blackouts of about a half-hour duration or longer. So all the ones that we've had are less than a half hour.

So when Themis says there have been four precursors which is what he said is correct, they're not exactly the kind of blackouts that we're talking about in terms of high risk because they have been less than a half hour.

COMMISSIONER BERNTHAL: So these four were all less than a half hour --

MR. BARANOWSKY: That's right.

COMMISSIONER BERNTHAL: -- and the numbers, 10 to the minus 3 to 10 to the minus 5 refers to station blackout longer that one half hour?

MR. BARANOWSKY: Right.

CHAIRMAN ZECH: We haven't had any longer than a half hour; is that right?

MR. BARANOWSKY: No full blackouts that I know of longer than a half hour.

CHAIRMAN ZECH: All right.

COMMISSIONER BERNTHAL: Okay.

CHAIRMAN ZECH: All right. Thank you. Go ahead, please.

MR. SPEIS: Consistent with what Pat said, the extended duration blackouts, that is more than two hours, are the ones that we are mostly concerned, Item No. 6 on the viewgraph.

In general, this is our assessment, you know, that most plants possibly are able to cope -- could be able to cope with blackouts for around two hours, but we need to -- some evaluations to confirm this.

At present there is no regulatory requirement for plants to cope with station blackout.

May I have next viewgraph, please.

[Slide.]

MR. SPEIS: Here we summarize some of the findings. The key point here is that everything is variable. The reliablity of on-site emergency AC power systems varies considerably. The factors here are the variety of plant designs and configurations, the emergency diesel generator reliability configuration.

What I mean by configuration, Mr. Chairman, is how many diesels you have and how many you need for decay heat. For example, some plants have three and they need two, some plants have three and they only need one. So that's an important factor. Common cause failures, design errors, human errors, and things of that sort.

Frequency and duration of off-site power also varies considerably. Site is an important consideration which of course is affected by the weather, the grid design configuration, and plant specific factors associated with the CCR design, transmission lines.

I've taken all of these things into account -- then core damage frequency that can vary considerably from plant to plant. As we said earlier, that can vary anywhere from 10 to the minus

4 to 10 to the minus 6 per reactor year which is sources of magnitude.

Important factors here are the susceptability to station blackout and of course the ability to withstand the loss of all AC power.

Here we're talking about specific plant attributes. For example, the ability of the reactor coolant pump seal to withstand station blackout, the capacity of water, electrical power, air systems, all these are important attributes that tell you about the capability of a plant to withstand station blackout.

Again our proposed resolution considers plant unique characteristics and provides a cost effective way of achieving a plant specific solution.

Our approach has been to look into this in a graded way and the plants that have less reliable power sources because of location or configuration, they'll have to do more or less again depending on how good or how bad they are.

So we don't want to come up with a blank regulatory requirement that we'll treat all plants equal. Plants that are better should do less; plants that need to do more, should do more. So that has been our approach. Okay.

The next viewgraph goes into some more details of the proposed resolution itself.

[Slide.]

MR. SPEIS: Again the final solution consists of a rule and a regulatory guide. We are proposing to amend 10 CRF 50 by adding Section 50.63, Loss of All Alternating Current Power, which requires that all plants be able to cope with station blackout for specified duration.

Again this is the graded approach. This specified duration, I will discuss it later on, but I want to say right now that it will be based on plant specific characteristics which affect the reliability of both the on-site and off-site power system.

An alternative AC power source is an acceptable option. As Mr. Stello said already, we prefer the alternate AC power source due to additional safety benefits.

Also as part of the resolution, we are proposing to issue Regulatory Guide 1.155 which provides general guidance of how to comply with the rule itself. The guidance addresses such things as severe weather categories, required levels of emergency diesel generator reliability, and other related assumptions.

Also it provides guidance on the station blackout analysis, how does one go about developing -- deciding the duration which depends on these off-site and on-site factors.

Also it provides guidance on the use of the alternate AC sources.

And also it --

COMMISSIONER ROBERTS: Pardon me.

MR. SPEIS: Yes, sir.

COMMISSIONER ROBERTS: What do you mean when you say QA considerations?

MR. SPEIS: What type of quality assurance has to be considered. This issue can be --

COMMISSIONER ROBERTS: What else can this be?

MR. SPEIS: Mr. Roberts, this issue is not treated as part of -- as a design basis accident because it is there for -- the requirements that we imposed on the additions to the plant itself to meet the rule are not the same as the stringent requirements that we apply for design basis accidents. And these are described in the Regulatory Guide itself. That's what we mean by -- for example, they don't have to be seismically qualified.

We think that losing power is more frequent

from other events than from a seismic event, for example; therefore, if they add something, it does not have been to be seismically qualified and that's what we mean by that as an example.

CHAIRMAN ZECH: What you're saying is that this rule is in the category that is considered above the design basis requirements?

MR. SPEIS: Yes, if we look carefully --

CHAIRMAN ZECH: It enhances safety beyond the design basis; is that correct?

MR. SPEIS: Yes. It's like ATWS. The ATWS category basically. We looked very carefully at the quality atrributes of systems that have to be added.

CHAIRMAN ZECH: I understand that, but it is above --

MR. SPEIS: To some extent, yes. It is somewhere in between.

CHAIRMAN ZECH: Somewhere in between what?

MR. SPEIS: The design basis and the non-design basis.

COMMISSIONER BERNTHAL: It's designed to allow you to cope with the design basis accident or avoid the design --

MR. SPEIS: Avoid --

COMMISSIONER BERNTHAL: -- well, that's not

the correct terminology either, but --

MR. SPEIS: I guess I'll need the help from the lawyers when it comes to defining --

COMMISSIONER BERNTHAL: It's a preventive measure.

MR. SPEIS: It is a preventive measure yes, but it goes beyond the regulations to some extent.

CHAIRMAN ZECH: That's what I'm trying to clarify.

MR. SPEIS: Yes. Yes. Our regulations deal with reliability, you know, there is GDC-17, general design criteria 17, that talks about -- we have to have a power source, it has to be reliable and so on and so forth. It does not address coping and we find from experience, from the extensive experience that I mentioned earlier, that we can further reduce the risk from this issue by being able to cope with station blackout. Somewhat, it is beyond the design basis. Maybe Vic can --

MR. STELLO: Clearly this is an issue which we believe merits adding the additional safety we get by doing this. It is safety beyond that now contained in our regulations which set the design basis for the plants.

CHAIRMAN ZECH: Right. That's what I wanted

to clarify.

MR. STELLO: This clearly goes beyond the design basis as set forth.

CHAIRMAN ZECH: Yes. That's what I wanted to clarify. Thank you. Let's proceed.

COMMISSIONER BERNTHAL: Let me ask another statistical nit here that's bothering me. How did we get to 1500 reactor years in this country? We haven't had an average of 50 plants per 30 years, and we're only getting 100 year right now. Are we counting subs or something?

MR. STELLO: Do you have the number, Pat?

MR. BARANOWSKY: I guess I didn't hear the question.

MR. STELLO: What's the total reactor years of operating experience for U.S. reactors? Do you have that?

MR. BARANOWSKY: It's over 1000. I don't think it's 1500. I don't know what it is right at this minute.

COMMISSIONER BERNTHAL: It is over 1000?

MR. BARANOWSKY: Yes.

COMMISSIONER BERNTHAL: Okay.

MR. STELLO: If you'd like, we'll give you --

COMMISSIONER BERNTHAL: It's not the sum. That's a small point. It can't be 1500, though.

CHAIRMAN ZECH: I'm well aware that it's over 1000. I've got it in one of my statistics books that I keep. I don't recall the exact number either but I know it's over 1000 hours of commercial nuclear power operations -- years of nuclear power operation in our country.

COMMISSIONER BERNTHAL: I guess I can believe 1000; I can't believe 1500.

MR. SPEIS: Next viewgraph, please.

[Slide]

MR. SPEIS: We have listed here some of the additional benefits of the alternate AC power. We say it provides a means to cope with the reactor coolant seal failure which therefore this additional power source -- or this alternate AC power source can be used to power independent pump seal cooling systems.

At present, we have made the assumption that as part of the resolution of A-44 that the seal does not fail, but there is a degradation of some sort, and the maximum leakage is 25 GPM. And based on that, there is no problem.

So the assumption that is made then is that

the seal is not going to fail. But we have a separate issue dealing with the seal issue, and if from that issue we find out that the seal indeed fails, given a station blackout, then that leakage could go anywhere from 60 to 400 or so GPM. In that case, they'll have to prove that their seals -- plant specific analysis will have to be done to show that the seal does not leak or some independent system has to be provided to be able to cool the seal itself and that's why we are saying there is a benefit by going with the alternate AC sources at this point this time. It will take care of the seal issue so that we won't have to argue with that issue later on.

Also it simplifies operator actions needed to cope with station blackout. Basically you go directly into the alternate source so you don't have to undertake activities that involve the loss of power itself.

Also it alleviates environmental concerns associated with station blackout. For example, overheating of electrical equipment and control room habitability.

So we're recommending then that we add to Section 50.63, Section 2, C.2, the thing that is in the parenthesis there. If the potential for common

mode failures can be minimized, use of an alternate AC source is a preferred option since this approach will also benefit other safety concerns. The next viewgraph slide.

[Slide.]

MR. SPEIS: The rule itself again -- its licensed LWR plant must be able to withstand for a specified duration and recover from a station blackout. Item 2, which is very crucial which goes into the graded approach that I mentioned earlier, Mr. Chairman, where the duration itself will be based on plant specific characteristics as well as location of the plant itself.

These are the four important factors that the duration will be based on, the redundancy of the on-site emergency AC power resources -- it's how many you have and how many you need -- the reliability of on-site AC power sources, the expected frequency of the loss of off-site power, and the other one is the probable time to restore off-site power.

The use of alternate AC power sources is an option, we mentioned that already. And of course the Reg Guide provides the guidance for complying with the rule itself.

This brings my presentation to an end, and

Mr. Thadani now can continue from NRR to discuss the implementation and the review priorities.

MR. THADANI: Good morning.

CHAIRMAN ZECH: Good morning. Please proceed.

MR. THADANI: Thank you. If the station blackout grew, as is structured now it would require the licensee to make an information submittal in about nine months following the issuance of the rule.

[Slide.]

MR. THADANI: The content of the submittals would be expected to include the duration of that plant as well as justification of that category; proposed modifications, if any, to meet the requirements of the rule, and the schedule for implementation of the modifications.

We expect submittals covering over 100 plants, so it's clear that it's important that we prioritize our activities and focus on those plants which deserve early attention.

And our basis for looking at plants would be relative safety significance. The top priority will be given to plants which, we believe, were most susceptible to station blackout events.

We have information from Office of Research

which has identified we believe approximately 17 units which belong in this category, and we would pay early attention to those units.

We would also screen early on the licensee submittals to identify, determine if there are other plant units that need early attention.

We'd use other other factors in assigning priorities as Mr. Stello and Dr. Speis have mentioned that if proposals come in with alternate AC power source, we expect to assign higher priorities for two reasons: Number one, not only would that approach resolve the station blackout issue, but it would also likely resolve some of the other issues in some of the operating reactors.

So we would assign high priority for that reason, plus our review, I expect, would be minimal in those cases.

For the remaining plants we will include consideration of residual risk. For example, we would expect to pay higher attention to plants with Mark-1 and ice condenser containments over plants which have large dry containments.

Our focus is going to be what's most important in terms of -- again in safety we can achieve. Let's work on those plants first and go on

down.

Mr. Rosa is going to discuss what we're going to review, the content of our review as well as the schedules to these reviews, and I think it would become a little clear to you why it is important for us to prioritize our activities. And those are the kinds of thoughts we'd utilize in prioritizing our activities.

CHAIRMAN ZECH: All right.

COMMISSIONER BERNTHAL: Let's see. The NUREG 1150 results -- just refresh my memory here -- did show a station blackout to be the dominant risk for the ice condensers --

MR. STELLO: BWR.

COMMISSIONER BERNTHAL: -- and the Mark-1's.

MR. STELLO: No, the Grand Gulf and the Peach Bottom, I think we were in the 90s. One was 95 and the other 80 something.

COMMISSIONER BERNTHAL: And the ice condensers as well?

MR. STELLO: I don't remember.

MR. THADANI: The ice condenser was very significant.

COMMISSIONER BERNTHAL: That's what I thought.

MR. STELLO: That's the ignitor problem.

COMMISSIONER CARR: I have a little trouble trying to figure out why you would put a high priority on the ones who have alternative AC source proposals since it looks like they would be solving the problem and you could leave them until later and go to the guys who might not have the problem solved.

MR. THADANI: In fact, those licensees who proposed alternate AC power source, we'd like to take a quick look and make sure we're satisfied with the proposal so they can go ahead and implement and make the necessary improvements early on.

So that's really the motivation: Not to hold it back, not to delay implementation.

COMMISSIONER CARR: Okay.

CHAIRMAN ZECH: All right.

MR. THADANI: Okay. Mr. Rosa will discuss --

CHAIRMAN ZECH: Thank you very much. You may proceed.

MR. ROSA: Next slide, please.

[Slide.]

MR. ROSA: The Regulatory Guide 1.155 describes the means acceptable to the Staff for achieving conformance with the rule. And the Staff

review will simply ascertain that by review of the applicants' submittals, that the guidelines of the Reg Guide have been implemented and thereby achieving the attainment of requirements of the rules.

The review will focus on those aspects of the requirements that are deemed most important for verifying conformance with the rule, and the first is the determination of the proposed minimum acceptable station blackout duration. The review will make sure that the characteristics of the off-site and on-site power systems and diesel generator reliability have been adequately considered in arriving at the minimum acceptable station blackout duration.

The next important element in assessing conformance with the rule is the station blackout coping capability that will be described in the submittals. We expect that those plants that elect to provide coping capability analyses will do so in some detail and the review will verify that we are in agreement with the assumptions and the results of the analyses.

COMMISSIONER BERNTHAL: Are you going to make a suggestion as to what you think would be a minimum acceptable coping time under any circumstance? I mean let's just say good engineering

judgment or common sense. Would the number be four hours or two hours or one hour or what would it be?

MR. ROSA: Well, the guidance has a category of two hours for those plants that are most capable of sustaining a station blackout. They're least susceptible to a station blackout. I would expect that that would be a minimum.

MR. STELLO: I don't understand that, but let me clarify now before we get too far. I thought that if someone met all the requirements for alternate AC they did not have to show any coping capability, it was not required.

The answer is zero if you add additional power supply that eliminates the blackout as a consideration that you need not show any coping capability; am I wrong?

MR. ROSA: No, you're not wrong. An alternate AC source that can be started within an hour is acceptable, but coping capability has to be demonstrated for that one hour.

If the alternate AC source provided can be started and brought into play from a shutdown in ten minutes, then no coping analysis is required. That's what the guidance states.

COMMISSIONER BERNTHAL: I guess the thing

that bothers me a little bit about that philosophy is that -- well, let me ask a question. Have you looked at the comparison of what the world standard is these days -- compared this with the world standard to determine whether in fact you then will be going beyond the world standard in terms of alternate capability? Because -- I'm using world standard generically. The French, for example, I believe, require something like 20 hours of coping capability. The Germans I believe require something like eight hours if I remember correctly. I'm not certain about these numbers any more.

But generally the Europeans have required, all other things aside, I believe, a fairly extended period for coping, quote unquote, but I don't know, quite frankly, whether the kind of analysis that you are proposing, redundancy really, whether that sort of comparison has been carried out. Maybe you could comment on that.

In other words, have they not paid the attention that you intend to pay to the redundancy in a plant with alternate sources?

MR. ROSA: I believe that -- considering the differences in off-site power reliability and frequency of loss of off-site power that exists

between, let's say, the Europeans and ourselves, that rule is adequate for meeting the U.S. requirements in regard to station blackout.

Now the French, I believe, in their Palo Alto reactor do provide coping capability in the order of 20 hours.

MR. SPEIS: I will like to say something because basically the French approach is not different from our approach. They have provided cooling, direct cooling to the seals.

They have found from their analysis that the Achilles heel is the coping domain, okay, and therefore they provide an independent power source and that is our recommendation, too.

To compare coping times, whether they are 15 or 4 hours, you know, these are not very easily done. For example, if you don't consider equipment qualification or if you lose power for ten hours, somebody has to make sure that the equipment is operable that are needed for the duration of the coping, and I don't think those analyses have been done to really prove that one can cope for eight hours or 16 hours.

Therefore, in fact, that is the reason, even though they say that, that is the reason in their

last analysis they go and put an independent power source to cool the seals. So in that regard, yc know, our proposal is not different than theirs.

CHAIRMAN ZECH: We have a comment from --

MR. RUBIN: Yes, I'd like to amplify a little bit. My name is Alan Rubin, task manager of the U.S. Site 44. Having visited the Palo Alto site and reviewed the French experience, there is some other reasons why the French and other countries have gone beyond what we are proposing in this resolution.

One important part is the stability of the grid and the frequency of initiating events of losses of off-site power.

I believe the French have about a factor of two higher frequencies of total losses of off-site power than we have here, and that's a direct factor in terms of the frequencies of core damage.

COMMISSIONER BERNTHAL: A factor of two, yes, that's not a terribly impressive difference. What about Germany where I think it's eight hours? Isn't it six or eight hours?

MR. RUBIN: I haven't seen the data for the frequencies for German losses of off-site power, but in Sweden I know they have had some large losses which have affected a significant portion of the

country, I'd say about half the country and they got particularly concerned because of the north-south transmission lines in that country and they have additional redundancy in terms of diesels and gas turbines at that site because of the transmission line situation.

COMMISSIONER BERNTHAL: And you don't know about Germany.

MR. RUBIN: I don't know about the frequencies of losses, but I know they have additional capability in terms of redundancy, diversity in power supplies.

MR. SPEIS: The Germans rely on diesels basically. They don't have any extra cooling of the seals. They don't think it's a concern because of the large number of diesels they have basically.

The English for their size, well, they rely on seal cooling just similar to our proposal, and the French, so I think in general, you know, we're not inconsistent with --

COMMISSIONER BERNTHAL: Well, the reason I make a point of it -- and we should go on here, but that's the first question that you and this Commission is going to be asked, it seems to me, because whether we're playing on the same level field

or not -- and it sounds like what you're saying is that we're not -- at least the word that's around is the French have 20 hours and the Germans have eight hours and the Swedes, I don't know how many hours they have, I don't know what the Japanese have either, and it just seems to me that we better be prepared to explain why what we are doing is the functional equivalent of that. I think that's what you're telling us.

MR. SPEIS: I think, yes. And we have looked very carefully at what the grid is, what the Germans and what the Swedes and what the French have done, and I think we're satisfied that we are, if I use your words, functional equivalent.

COMMISSIONER BERNTHAL: Okay. Just so that we've got that nailed down --

MR. SPEIS: Yes.

COMMISSIONER BERNTHAL: -- because I think it's important.

MR. MINNERS: A small clarification. We were just talking about two hour coping capability. I think most plants will probably have a four hour capability because the industry has indicated that they will make a commitment to make changes to the design and put everybody in a four hour category.

The rule allows or requires some plants -- or allows some plants to have a 16 hour coping capability depending on those -- if they are unusual plants. We don't expect to find many or any of those, but there's a possibility that some plant would have to have a 16 hour capability.

CHAIRMAN ZECH: All right. Can we proceed?

MR. ROSA: The next area of concentrated review effort will deal with the modifications, potential modifications that would be proposed in ICT submittals.

These areas include alternate AC source additions, reactor coolant pump seal failures, features to prevent reactor coolant pump seal failur , battery capacity, addition of or adequacy of existing batteries, condensate storage capacity.

Now the review will attempt to ascertain that any modification may in fact do -- provid the intended enhancement in coping capabilities and it will also verify that whatever modifications are made, do not adversely impact existing safety related systems.

An additional element of the review will address what procedures in training are being provided for station blackout.

It is expected that regional audits may be performed to look at the procedures that are in place and the training that is being conducted.

Finally, the question of operability requirements for station blackout equipment, how these are defined and implemented.

The question of possible imposition of technical specifications has been discussed. These requirements could also be contained in administrative procedures.

If technical specifications are decided on, I believe they will be minimal in addressing perhaps at best the alternate AC source operability requirements.

In any event, whatever is decided on in regard to technical specifications will conform to the Commission's interim policy statement on technical specifications. Next slide, please.

[Slide.]

MR. ROSA: The schedule shown on this slide assumes that the station blackout rule will be issued on June 1st of this year. It takes into account the 270 days allowed for industry response, and it assigns what we consider to be a reasonable allocation of Staff resources to this task given the

other workload that has to be performed and the amount of technical assistance funding that is made available for this task.

The rule states that 30 days after the notification to a licensee that their proposed fix for the station blackout issue is acceptable, that they should provide a firm schedule for implementation which should not exceed two years unless some very firm justification for extending that beyond two years is provided.

So the completion dates or implementation dates shown on there fall two years and one month following the Staff evaluation completion for the particular sites.

The reviews have been based on site reviews rather than unit reviews because in a site review, a unit -- a two unit site with essentially similar plants would not require two reviews. So it's shown there in terms of site reviews.

The first 24 highest priority sites, the review would be completed by November the 1st of '89; the next 35 sites evaluation would be completed by October 1st of '90; and the final 16 remaining sites evaluation will be completed on March 1st of '91.

If things go according to plan, all sites

should have implemented the station blackout rule by March 31st of '93.

I might say one other thing about the review process. We have interacted with the utility working group that produced NUMARC 8700, their initiatives document, and have obtained an agreement in most areas.

We believe that this will result in a standardized licensee submittal in both format and content which will ease the task of the Staff in reviewing it.

I think that's a plus for both the regulatory process and the industry.

CHAIRMAN ZECH: All right.

MR. STELLO: We're through, Mr. Chairman.

CHAIRMAN ZECH: All right. Thank you very much. Questions, my fellow Commissioners? Commissioner Roberts?

COMMISSIONER ROBERTS: March the 8th, we sent you a bunch of questions and you responded. I think I read it last night. Response to Question 4: "Plants with very short required coping times may be able to disband seal failure without core recovery." Qualify that. What is short?

MR. SPEIS: Several hours, Mr. Roberts.

COMMISSIONER ROBERTS: Several hours?

MR. SPEIS: Yes. A few hours, less than four.

CHAIRMAN ZECH: Do you want to come to the microphone, please. Identify yourself for the reporter.

MR. BAER: Yes, I'm Robert Baer. It's a complicated issue. If all the seals --

CHAIRMAN ZECH: Identify your --

MR. BAER: Oh, I'm Chief of the engineering and issues branch in Research.

CHAIRMAN ZECH: Thank you very much.

MR. BAER: This generic issue 23 is assigned to my branch. If all the seals -- if the seals fail completely on a given pump, leakage could be as great as 480 GPM.

And with four pumps, it could withstand only about an hour or so before the core is uncovered. If there was no other -- you know, if you don't cool the seals.

So it could be for plants under an hour, you could probably expect complete seal failure. But for longer duration coping times, the seals have to hold at least to some degree.

CHAIRMAN ZECH: All right. Thank you.

Anything else, Commissioner Roberts?

COMMISSIONER ROBERTS: No.

CHAIRMAN ZECH: Commissioner Carr?

COMMISSIONER CARR: No.

CHAIRMAN ZECH: Commissioner Rogers?

COMMISSIONER ROGERS: Well, yes. This timetable, the 3-31-93, full implementation date, is that set by the availability of NRC Staff resources to review licensee proposals?

MR. ROSA: I would say that to some extent it is. We have considerable other workload. Events are occurring day by day that require Staff effort in reviewing and resolving, and we have devoted what we consider to be a reasonable amount of Staff resources for this task.

COMMISSIONER ROGERS: Well, suppose a licensee wants to go faster and get this thing out of the way and behind them, are they limited by your identification of the highest priority sites?

Suppose somebody, in your opinion, has a low priority site, wants to get it behind them and get it off their books by moving more rapidly, will they be prevented from doing so because of the Staff limitations?

MR. ROSELLO: No. We encourage it. And if

all of them want to do that, we'll find a way to get them done.

COMMISSIONER ROGERS: All right. And it seems to me that that's a rather long time to wait to get this issue totally bundled up and put to bed, and I would think, anyway, if we could move more rapidly, it would be very desirable and I would hope that the limitation just isn't simply our own Staff's resources and inability to review proposals.

MR. STELLO: Let me say what I have said a number of times in the past, that I think the industry ought to seize on this particular issue as an opportunity to solve not only the station blackout issue, but if they go about doing this carefully, they can integrate and solve a number of other issues that -- the pump seal being one, decay heat removal being another issue. There are other issues that are out there and I think they could go a long way in getting rid of when they look at the plant from their own perspective, so I'd hope that the schedule allows sufficient time for them to be able to take a pretty good look at being able to integrate a whole base of solutions into the plant.

COMMISSIONER ROGERS: Well, I'd just like to say that I really didn't have as much time as I would

like to really study the report, but everything I've seen of it seems to indicate that it's an un usually capable and fine piece of work, and tough issue, thorny issue, and the detail and thoroughness with which the Staff approached this problem, I felt to be very impressive. To try to get your arms around it and get it in some kind of a shape for dealing with what I thought was really an impressive piece of work.

I want to compliment you on it, everyone who participated in it.

COMMISSIONER CARR: Can I follow up on that a little bit? Does the utility have to get our permission to add on-site power sources? I don't see any reason they should. They might have to get our permission to hook it into our system but I would think they can go all out and if they want to put in a gas generator or something, they could put it on site certainly without us telling them they couldn't.

MR. STELLO: But the application of bringing that onto the site to dealing with the compliance of this rule --

COMMISSIONER CARR: Well, as I say, for that they may have to have our permission to hook it up. They could go a long ways to getting the problem

solved before 1993, I'd think.

MR. STELLO: They could do that now.

COMMISSIONER CARR: Okay.

COMMISSIONER BERNTHAL: Yes, I share the concern, though, that Commissioner Rogers raises. It is an awfully long timetable and we've had one or two cases of plants that were waiting for start up where they have taken fairly rapid steps on their own, bring in gas turbines or whatever it might be.

You know, you guys -- we have to worry about hooking it up, as Commissioner Carr says, but I would hope that we don't get distracted by global solutions here when we have one rather important item that as you point out and as that page shows represents 90 percent, 90 odd percent in -- well, one assume in many of the boilers.

So that by taking care of that single item, in effect I guess you dropped core melt probability a factor of ten. I think that's pretty important. We ought to get at it.

MR. THADANI: Yes. In fact, if I may just make a comment, if the utilities were to come and propose some alternate AC power source, I'm firmly convinced that our review process is minimal in that regard, and it gets down to the point of hooking it

up, essentially. And if that were the proposal, then I don't expect the Staff would need to do much of a review and therefore the schedule would in fact be inappropriate as you see it.

The schedule is developed on the basis of a substantial amount of analyses and reviews and back and forth, if you will, but nevertheless the focus of our review will be to address plants where we believe this issue is very important as early and as quickly as possible, and that's what we mean by dividing it up in terms of number of sites that we have -- we intend to address early on. So we are very sensitive to the point you make, Commissioner Rogers.

COMMISSIONER ROGERS: I will hope that if this whole thing is approved and goes through and goes into action, that we be would be kept informed of how this implementation schedule is actually working in practice and that I would hope to see some modification of it once the process begins, that maybe some new things would come such as initiatives from the industry itself, to move more quickly and rapidly to get this thing behind them.

I would think that everybody would like to see this thing cleaned up and out of the way because it's been hanging around for so long and it looks as

if you've got all the elements here to move fairly quickly and rapidly to clean it up.

MR. STELLO: We'll do our best to improve the schedule and we will keep the Commission informed if it goes forward with the rule on progress.

CHAIRMAN ZECH: All right. Commissioner Bernthal?

COMMISSIONER BERNTHAL: Yes, I had a couple of other things I wanted to ask about, and then a suggestion.

I'm not sure I quite understood. If we can go back to one of your slides here, I guess it's No. 5, I'm not sure. You have this additional recommendation which has, I believe, appeared between the time you sent the package and now.

If I missed the point when you explained it then you'll have to re-explain it, but I didn't quite understand why you have reached a technical judgment that an alternate AC source is to be preferred over whatever the other options might be. Why is that?

MR. SPEIS: Well, we reached the point, I guess, in the last few months or maybe few weeks that we looked at the resolution of the seal issue, and if we are not able to ascertain the integrity of the seal, then it's possible that one of the requirements

will be to put a power source to provide cooling to the seal itself. So we are bringing this to the attention -- we are bringing this right now on this issue because it's an integral part of this issue. Independent power sources provide it, it results for the cooling of the seal, the reactor coolant pump seal at the same time, so --

COMMISSIONER BERNTHAL: I'm not sure I -- you're going to have to do a little more better. I'm not sure I follow you.

MR. STELLO: Let me give you a few more reasons. Look at the 80 percent core melt frequency -- 90 percent core melt frequency. Those plants will probably meet this rule without doing anything. Okay?

COMMISSIONER BERNTHAL: Yes.

MR. STELLO: So you are going to wind up with still dominating. If you add an alternate power source, you're going to get a factor ten reduction in those plants.

Remember, they have been re-analyzing in the 10 to the minus 6 range now.

COMMISSIONER BERNTHAL: Yes.

MR. STELLO: Excuse me, down two. Second, there are the -- a lot of the intangibles that you

get as indirect benefits of having that alternate source especially if it's diverse. You don't have to worry about any common mode failures, contamination of fuel supplies, common mode failures due to maintenance or whatever, especially with the diversification.

In addition, events in the plant such as floods, fires, the kinds of things that again become intangible that can affect a lot more equipment.

You add substance -- dimention to the defense in depth that you have in the plant by having the diverse alternate power source.

We aren't saying you're required to do, but everything we know suggests that you have through it the mechanism to solve a whole host of other technical issues and further substantially improve the safety of the plant.

COMMISSIONER BERNTHAL: Okay. What, for example, qualifies, just for my information, as an alternate AC source? Does that mean, for example, that you bring in a gas turbine or --

MR. STELLO: A gas turbine, another diesel generator.

COMMISSIONER BERNTHAL: Okay.

COMMISSIONER CARR: Let me ask you if I

understood what you said. It sounds to me like what you're saying is that they may qualify adding additional power source under the blackout rule, but when we solve the pump seal problem we may require it anyway.

MR. STELLO: And that's why I said I hope to make the statement that when the industry goes out and they look at all the other things that are out there on the horizon as they understand it, things they'd like to do with this plant.

This may be a desirable thing for them to do. They wouldn't have to deal with the coping analysis at all if they did have an alternate source.

COMMISSIONER BERNTHAL: Okay. I want to get back just a little bit to the minimum, although I guess the minimum is zero hours of coping capability.

You've been giving an explanation of why we in the public should be willing to accept what on the surface at least appears to be a different -- appears to be a lesser standard for coping capability than -- it seems to be the mode now in Europe these days, and I would just suggest that there needs to be put together fairly coherent understandable comparison and explanation of your arguments for why we are the functional equivalent, if you will, if indeed we are,

to the requirements that Europe is placing on its plants, and included in that kind of argument and justification it seems to me should be the consideration of the differences of off-site power reliability, for example, as you've mentioned, but also included in it should be the fact that weather conditions in this country, particularly in the winter, very often can be much more severe than in France and Germany, for example. You don't believe that?

MR. STELLO: Down in the Alps?

COMMISSIONER BERNTHAL: Oh, come on, Vic. Most of France and Germany is not the Alps.

MR. STELLO: But you've a lot of interconnecting grid systems that go over the mountains and there are problems.

COMMISSIONER CARR: I remember last winter when they froze up the river, they lost quite a few of their nuclear plants because the intakes were frozen.

MR. STELLO: Let me -- I see where you're going and I'm a little bit troubled because I don't know that we even have enough information or if it's wise for us to try to get into studying their off-site power supplies, the weather problems, the

kinds of things that we have generated an awful lot of data and had access to a lot of data in the United States to really be able to go through that.

COMMISSIONER BERNTHAL: What I'm saying is that it seems to me that one of the principal causes of long-term loss of off-site power, at least in this country, will be weather-related. You don't have to live in the Midwest very long or the Northeast or the vast land mass of the United States of America to understand that's far more likely in this country than in the more benign climates of Europe. I mean, Europe is simply a more milder climate.

MR. MINNERS: But I don't think the statistics show that. I'm no expert on this, and correct me if I'm wrong, but I think the French have a higher rate of loss of off-site power --

COMMISSIONER BERNTHAL: But that may be for different reasons. Is that true?

MR. MINNERS: But I guess the point I'm trying to make, you have to look at the overall loss.

COMMISSIONER BERNTHAL: No, I agree. And I agree the reliabilty of the system is on the one hand, but on the other hand are these factors that are more severe in our country.

All that I'm saying is that those are the

questions that are going to be asked and we better be prepared to answer them.

MR. STELLO: Well, I could tell you this. If they're asked anywhere in the foreseeable future, we're not going to be able to answer and in order to answer them, we're going to have to initiate a very, very large program.

We do not have the kind of information -- you would need to know the stability of the grid systems in each of those countries and that's going to take a great deal of doing. We don't have that information.

COMMISSIONER BERNTHAL: We have no statistics on loss of off-site?

MR. STELLO: We could go try to get them, but we don't have them readily available, and we don't have very much information on the details of what they've done for their coping analysis. All we do know is that the French started out that way. When they did, they decided they had to go back and add additional equipment in the plant for the coping with seals, I don't know what else they did. I don't really know that we have a fairly good understanding of what the Germans did. We'll have to go back to them and collect a lot of information.

We'll do that if the Commission wants us to, but we don't have it now and it will take a substantial effort for us to do it.

MR. SPEIS: I think it is fair to say that the Germans and the Japanese -- we're not aware that they have done any coping now because they depend on this reliability.

You know, the Japanese, they overhaul their diesels and every month or every six months, whatever, and they want to make sure they operate -- I don't think they have done any --

COMMISSIONER BERNTHAL: I thought the Germans had an eight hour coping standard or objective?

COMMISSIONER CARR: I'm not sure all that data would be of any value other than just a discussion or an argument over who's doing it better than somebody else is.

What we are really saying is that we don't have a problem, we're trying to make them safer in the long run than safe and we are trying to get down another factor of ten, not in the reliability of power at the site, but we're trying to get down another factor of ten in the contribution to a core melt problem.

And I'm not sure it's worth going out on a major exercise to find out a lot of data just for argument sake.

COMMISSIONER BERNTHAL: Well, I think it's worth being able to give the public fairly convincing, straightforward, simple answers to the question of why can we permit in principle, at least zero hours when other countries are requiring rather long coping periods and -- I'm not convinced that we don't have the data at hand to make a coherent --

COMMISSIONER CARR: I would think the French citizens would be more on the other side arguing why do they need 20 hours of coping capability when we get by with only six?

COMMISSIONER BERNTHAL: It's all public perception that --

COMMISSIONER ROGERS: Mr. Chairman, if I could --

MR. STELLO: Excuse me. If I may say something. It's disturbing to me that there's a suggestion that if someone comes in and adds additional power supplies to the on-site system, a diverse turbine generator, that somehow in any way is less desirable or it's degree of goodness, if you will, is somehow less than a plant that maybe has 10

hours, 20 hours of coping capability. I'd certainly like never to have a station blackout is the better objective.

COMMISSIONER BERNTHAL: I'm not disagreeing. If you are prepared to say that, that's what I'm saying.

MR. STELLO: That's exactly what we're saying, is our preferred course is go to zero coping capability because you will not have a blackout. You will need none, zero analysis to show coping because you're not going to have a blackout.

COMMISSIONER BERNTHAL: Look, what I am saying is that I think you have the data and the arguments in hand to present to the public a coherent explanation, a simple explanation of why we don't have to do -- that's what you're telling us, we don't have to have coping time because --

MR. STELLO: Oh, that we can do because that's internal to us.

COMMISSIONER BERNTHAL: Now, you have already mentioned today the lower reliability of the European grid systems -- I don't know the statistics. I don't know whether that's true, but you've mentioned it and it seems to me that another element of consideration here on the other side of the

argument may well be the severe weather conditions that we're always subject or often subject to in this country.

We do after all deal with tornadoes. Other countries don't, for example. So all that I am saying is better put it together and be prepared to deal with it, and I think it's worth doing that so the public understands. That's all that I'm trying to say.

COMMISSIONER ROGERS: Well, if you simply present it in such a way that focuses on the advantages of the alternative power source, just what that does, that that reduces the time minimum that's required to establish a coping policy, then you can put those other numbers -- the other countries in some perspective and not have to use them as the starting point for your argument, you know, it's just background, and then you don't really need to do a detailed study because you're not going to base your reason on those data but on an alternate approach.

I'd like to just raise a little question about the wording of some of the pieces of paper here because it seems to me that it could be a little confusing in that the proposed resolution is referred to as one which requires that all plants be able to

cope with station blackout for a specified duration.

That's not what it is. It's that each plant be able to cope with station blackout for a specified duration.

And there isn't a single number that applies to all plants, and I see the public notice enclosure, one, uses those same words to require that commercial nuclear plants be capable of withstanding a total loss of AC power for a specified time.

That's not correct. That's strictly not correct. It's that each plant has its own time. And I would suggest that you carefully review the wording that goes out on this so that you're not subject to some criticism of saying one thing and doing something else that's different because it suggests that it's a single number, and there isn't a single number, there's a single approach, but there's not a single number.

MR. SPEIS: Al here brings to my attention in another paragraph it stated the way you're saying it so we'll better make sure it's consistent.

COMMISSIONER ROGERS: Yes. Right.

MR. SPEIS: Okay.

CHAIRMAN ZECH: Commissioner Bernthal, any other questions?

COMMISSIONER BERNTHAL: I had one other point I wanted to raise and I see there are industry representatives here so perhaps if we are not prepared to explain ourselves, the industry would like to explain, though, why what we are doing is good enough or is better, perhaps, than what the rest of the world is doing.

The last question on the backfit analysis. I have not had a chance to go through that element of your presentation here and it hasn't really been mentioned much here, but since this rulemaking and step here does go beyond adequacy, I take it we will have to base this rule on some sort of backfit analysis, cost benefit analysis, will we not?

The last time around on this issue, I thought it was a pretty shaky proposition, and I don't remember exactly what the numbers were. I think it came down to a factor of two and I'd hate to argue the errors on a number like that. Are we prepared to provide the arguments we need here or are we going to rely on qualitative arguments?

MR. SPEIS: Well, we have done the arithmetic to the best of our ability. I think the latest numbers that we came up with was that the value impact ratio showed numbers like two and a half

thousand person rems per million dollars compared to the thousand dollars that we use as a criteria. And that is of course with no on-site costs. If you use on-site costs, that number goes to six thousand.

Now the thing I said earlier, Dr. Bernthal, that we feel it meets the backfit rule and of course this is in the category of safety improvements and it does have to meet the criteria of the backfit rule.

COMMISSIONER BERNTHAL: What's the cost benefit ratio that you will argue now and what are your uncertainties?

MR. SPEIS: Well, I guess -- we discussed them in the report, I don't remember them, but, you know, that was our best estimate. That number can be anywhere from 500 to 5,000.

COMMISSIONER BERNTHAL: I think it was a factor of two. Is it still a factor of two or something like that?

MR. RUBIN: It's in the report. Alan Rubin again. I authored the regulatory analysis and on Table 12 of the regulatory analysis there's a summary of the cost benefit ratio. The best estimate is $2,400 -- excuse me. 2,400 person rem per million dollars. The high and low estimates, the high estimate is 5,000 person rem per million dollars, the

low estimate is 700 person rem per million dollars.

And the details of how those numbers were developed are included in NUREG 1109.

MR. SPEIS: With no on-site costs, right?

MR. RUBIN: That is without on-site costs. The number that somebody mentioned earlier of including on-site costs would double or triple the value of that ratio.

MR. MINNERS: It's 6100 with on-site.

MR. RUBIN: With on-site, that's right.

COMMISSIONER BERNTHAL: Is the Commission going to rely -- I'm asking the General Counsel now -- would the Commission rely on that numerical analysis or would it rely rather on a qualitative argument in this case?

MR. PARLER: Well, I'll answer it. I think the Commission always in matters such as this will rely on the best information that it has.

If cost benefit analysis in a situation like this were viewed as not favorable and not comparative -- not, relatively speaking, favorable with something else such as the costs standard, it is my judgment that they could and should rely on both including the qualitative judgment of the Commission that under the circumstances having gotten and

received the best analysis that they could, that either it is a right thing to do or it is not a right thing to do.

If under these circumstances they conclude that it's the right thing to do, I have a very high accomplished level, that if the backfit rule -- if the rule is challenged on the basis that it doesn't comply with the backfit rule that the rule will survive on that challenge. So it should rely on both.

COMMISSIONER BERNTHAL: Okay. Thank you.

CHAIRMAN ZECH: All right. Well, let me just make a couple of points.

[Commissioner Bernthal left the room.]

CHAIRMAN ZECH: Well, first of all, I'm informed regarding reactor years in our country that as of the end February of 1988, the 106 units that we had on line at that time have accumulated 1,076 reactor years of operation. And if you add the reactor years of operation of those plants that had been operating but are not permanently or indefinitely shutdown down, that's 94 more reactor years, so a total at the end of February cumulative in our country would be 1,170 reactor years of operation. That's just for the record.

Well, first of all, let me just say this. We are discussing a very, very important issue that's been before the Agency for a long time as we emphasized earlier this morning. I think the Staff frankly has done a very fine job in their analysis both by the research people and the NRR people and those who have supported them.

We're talking really about, as I understand it, beyond adequacy. It's an increasing -- enhancing safety really beyond a design basis which is I think very appropriate. You've told us that it does meet the backfit analysis.

[Commissioner Bernthal returned to the room.]

CHAIRMAN ZECH: I do think regarding Commissioner Bernthal's reference to other countries that it is worth looking into. I would think you'd perhaps have the information available and if you don't have, I would suggest that we could probably get sufficient information from our association with the European countries and I would suggest that you do that.

I think it is worth at least being as complete as we can to address that particular subject recognizing there are differences in the approaches

and so forth. It seems to me that's worth doing.

The alternate source approach -- I guess my question would be on that, why have you concluded that it would be acceptable for a utility to accept an alternate source, for example, an extra diesel generator or gas turbine and not perform a coping analysis so in order to demonstrate that there would be a high probability of handling a station blackout in a reasonable period of time?

Why have you -- as I understand it, that's what you've suggested. I'd just like to know the rationale for that.

MR. SERKIZ: Mr. Chairman, the reason -- the way --

CHAIRMAN ZECH: Maybe somebody ought to --

MR. STELLO: Warren.

CHAIRMAN ZECH: We appreciate you're trying, anyway. Maybe you could colleague -- and write him a note and he can try to explain it for you.

MR. MINNERS: Well, I think the basis of it is that the alternate AC source is going to be connected up -- be able to be connected up to the normal electrical distribution system. So you're not doing anything unusual and we are going to -- I guess maybe in lieu of a coping analysis, we will also

require licensees to perform a test. So once the equipment is installed, they are going to have to show that you can connect it all up and start it up and operate the equipment. So we are really having an on-site test pretty much in lieu of a coping analysis.

CHAIRMAN ZECH: All right. Go ahead.

MR. STELLO: Let me try adding a dimension to that. And if I remember right, a diesel generator, gas turbine, you can get 9.99 reliability and you'd have a potential there for a station blackout, whatever the number is, X, so you can add this independent power source. The potential of ever having that problem can then be reduced by one to two orders of magnitude.

Such you'd never have, you reduce it to a residual risk so low as the likelihood of ever having a station blackout that you don't need to do anything.

On the other hand, if you don't have that power source and you are dealing with just the overall probability of happening of X, then you need to add a dimension called coping or another way to say it is it allows you to be to deal with a station blackout for a length of time to provide you with the

time it takes to either have the off-site power restored or perhaps to repair or modify whatever you need to do to one of the diesels and get them started.

And typically the numbers, if someone would help me, if you can extend the loss or cope with a loss of off-site power for X hours, what's X, you can get about a factor of three or four improvement in having it restored.

What's the likelihood? Does nobody remember the number?

MR. BARANOWSKY: Typically if you went from say two to four hours, you get about a factor of three; in four to eight, about a factor of three reduction. Roughly, it varies.

MR. STELLO: That's the likelihood of having an off-site power restored.

CHAIRMAN ZECH: All right.

MR. STELLO: So it clearly is desirable to have that source on-site.

CHAIRMAN ZECH: All right. Commissioner Rogers, I think you --

COMMISSIONER ROGERS: Well, yes, on that, I wonder if you could tell me how it would work if a licensee installed, let's say, a diesel generator or

gas turbine or something of that sort, for emergency power, without doing a coping analysis and then for some reason after some period of time while this thing has been in place and sitting there and some routine test is performed on it, it's found that it has to be torn down and something has got to be fixed.

What condition does that put the plant in then? Is that a condition for shutting the plant down? Is it a condition for -- is it a condition -- what status is it in until that correction is made, particularly in the absence of a coping analysis? If there were a coping analysis that said well, you know, this plant is okay for eight hours or something of that sort and that's all the length of time it would take them to fix that alternative power source, then they're all right. But if it exceeds that, then what kind of a situation would they be in?

And if it wasn't a coping analysis, aren't they operating in a kind of a never never land under a circumstance such as that?

MR. STELLO: Well, if they put the alternate source of power on, I would assume include it in the technical specifications and allow some reasonable down-time and for repair.

If they exceed it, then, yes, they'd have to shut down if they are able to repair it within that period of time, just as they have for the on-site diesels today. Exactly the same philosophy.

CHAIRMAN ZECH: Let me emphasize one other point, too. If we step back and see what we're really trying to do in station blackout, of course, as we know, it's a loss of power on-site as well as off-site and the main thing that concerns all of us would be to keep that core covered. That means we need water, and in order to keep the core covered, we need power and that's really fundamentally what we're talking about and that's why it's such an important issue.

Whenever we have a real potential station blackout, the first thing I think about is how is the power situation because you got to get water to cover the core. And I know you -- this is what it's all about and so it really is an important issue and I think our efforts to enhance the safety in this regard is absolutely the right thing to do.

I, too, though, would like to make a reference to the schedule. I certainly hope we could speed up that schedule. I recognize there's many things involved that need to be analyzed and so

forth, but I would certainly encourage the utilities to take the initiative to speed up that schedule. I think it's important.

If I were a utility executive, I would certainly want to make sure that my facility would adopt these enhanced safety measures and so that in the middle of the night if I were a utility executive and they called me, I would not have to think about a shortage of power. I'd like to think I had extra power. I think if I were a utility executive, I'd put in not only an extra diesel engine but maybe two of them or maybe three. To me it's well worth the assurance that you're going to have power.

So I think we are doing the right thing and I hope the utilities will -- I think it's in their own best interest to add this enhanced safety to their plants.

So, I would also like to say to my fellow Commissioners that we have heard the briefing now. We all had a chance to think about this for a considerable period of time. We reflect on what we've heard and make any comments we may have to the Staff and perhaps we can move forward with this very important rulemaking issue.

Are there any other comments?

[No response.]

CHAIRMAN ZECH: All right. With that we'll stand adjourned. Thank you for a very fine briefing.

[Whereupon at 11:33 a.m., the meeting was adjourned.]

CERTIFICATE OF TRANSCRIBER

This is to certify that the attached events of a meeting of the U.S. Nuclear Regulatory Commission entitled:

TITLE OF MEETING: Proposed Final Rule on Station Blackout
PLACE OF MEETING: Washington, D.C.
DATE OF MEETING: Thursday, March 31, 1988

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.

MARIO A. RODRIGUEZ

Ann Riley & Associates, Ltd.

STATION BLACKOUT

(UNRESOLVED SAFETY ISSUE A-44)

COMMISSION BRIEFING
MARCH 31, 1988

THEMIS P. SPEIS
WARREN MINNERS
ALECK SERKIZ

OFFICE OF NUCLEAR REGULATORY RESEARCH

ASHOK THADANI
FAUST ROSA

OFFICE OF NUCLEAR REACTOR REGULATION

BRIEFING OUTLINE

DEVELOPMENT OF RULE:

IMPLEMENTATION OF RULE:

SUMMARY AND RECOMMENDATION

- COMMISSION DECISION TO ISSUE PROPOSED STATION BLACKOUT RULE FOR COMMENT — MARCH 5, 1986

- PUBLIC COMMENTS CONSIDERED AND INCORPORATED AS APPROPRIATE

- ACRS AND CRGR REVIEWS — JUNE 9, 1987; JUNE 23, 1987

- DISCUSSION WITH NUMARC'S WORKING GROUP ON STATION BLACKOUT (NUGSBO). INDUSTRY NOW AGREES WITH PROPOSED RESOLUTION — SPRING - FALL 1987

- STAFF RECOMMENDS THAT COMMISSION ISSUE FINAL RULE

USI A-44 SAFETY CONCERNS

1. STATION BLACKOUT (SBO) MEANS COMPLETE LOSS OF AC POWER TO ESSENTIAL AND NON-ESSENTIAL BUSES (LOSS OF OFFSITE POWER AND THE UNAVAILABILITY OF THE ONSITE EMERGENCY AC POWER SYSTEM).

2. LIMITED DECAY HEAT REMOVAL (DHR) AND NO CONTAINMENT HEAT REMOVAL (CHR) W/O AC POWER.

3. SEVERE WEATHER CONDITIONS (E.G., HURRICANES, ICE STORMS, TORNADOES) ARE MAJOR CONTRIBUTORS TO LOSS-OF-OFFSITE POWER (LOOP).

4. ESTIMATED RANGE OF FREQUENCY OF SBO IS 1E-3 TO 1E-5/RX-YR.

5. ESTIMATED RANGE OF CONTRIBUTION OF SBO TO CORE DAMAGE FREQUENCY (CDF) IS 1E-4 TO 1E-6/RX-YR.

6. EXTENDED DURATION SBOS (> 2 HRS) CAN BE SIGNIFICANT CONTRIBUTORS TO RISK.

PRESENTLY THERE IS NO REGULATORY REQUIREMENT FOR PLANTS TO COPE WITH STATION BLACKOUT.

SUMMARY OF STAFF FINDINGS
(NUREGS-1032 & -1109)

RELIABILITY OF ONSITE EMERGENCY AC POWER SYSTEMS VARIES CONSIDERABLY

- PLANT DESIGN AND CONFIGURATION
- EMERGENCY DIESEL GENERATOR RELIABILITY AND CONFIGURATION
- COMMON CAUSE FAILURES

FREQUENCY AND DURATION OF OFFSITE POWER LOSS VARY CONSIDERABLY

- SITE CHARACTERISTICS (WEATHER, GRID)
- PLANT FACTORS (SWITCHYARD DESIGN, TRANSMISSION LINES)

CORE DAMAGE FREQUENCY CAN VARY CONSIDERABLY FROM PLANT TO PLANT

- SUSCEPTIBILITY TO STATION BLACKOUT (SBO)
- ABILITY TO COPE WITH LOSS OF ALL AC POWER

PROPOSED RESOLUTION CONSIDERS PLANT UNIQUE CHARACTERISTICS AND PROVIDES A COST EFFECTIVE WAY OF ACHIEVING A PLANT SPECIFIC SOLUTION

PROPOSED RESOLUTION

1) AMEND 10CFR50 BY ADDING SECTION 50.63, "LOSS OF ALL ALTERNATING CURRENT POWER," WHICH REQUIRES THAT ALL PLANTS BE ABLE TO COPE WITH STATION BLACKOUT (SBO) FOR A SPECIFIED DURATION. AN ALTERNATE AC SOURCE IS AN ACCEPTABLE OPTION.

2) THE STAFF PREFERS THE ALTERNATE AC SOURCE OPTION DUE TO ADDITIONAL SAFETY BENEFITS

3) ISSUE REG 1.155, "STATION BLACKOUT" WHICH PROVIDES:

- GUIDANCE FOR SEVERE WEATHER CATEGORIES, REQUIRED LEVELS OF EDG RELIABILITY AND OTHER RELATED ASSUMPTIONS.

- GUIDANCE FOR SBO ANALYSES, PROCEDURES, AND TRAINING FOR COPING WITH SBO, AND Q/A CONSIDERATIONS RELATED TO ALTERNATE AC SOURCES.

- GUIDANCE ON THE USE OF ALTERNATE AC SOURCES.

- GUIDANCE ON EDG RELIABILITY MONITORING AND RELIABILITY PROGRAM.

ADDITIONAL BENEFITS OF ALTERNATE AC

1) PROVIDES A MEANS TO COPE WITH RCP SEAL FAILURE (GSI-23); CAN BE USED TO POWER AN INDEPENDENT PUMP SEAL COOLING SYSTEM.

2) SIMPLIFIES OPERATOR ACTIONS NEEDED TO COPE WITH SBO.

3) ALLEVIATES ENVIRONMENTAL CONCERNS ASSOCIATED WITH SBO (E.G., OVERHEATING OF ELECTRICAL EQUIPMENT AND CONTROL ROOM HABITABILITY).

ADDITIONAL RECOMMENDATION

THE STAFF RECOMMENDS ADDING THE FOLLOWING SENTENCE TO 50.63, SECTION C.2:

> "IF THE POTENTIAL FOR COMMON MODE FAILURES CAN BE MINIMIZED, USE OF AN ALTERNATE AC SOURCE IS A PREFERRED OPTION SINCE THIS APPROACH WILL ALSO BENEFIT OTHER SAFETY CONCERNS."

50.63 REQUIREMENTS

LOSS OF ALL ALTERNATING CURRENT POWER

1. EACH LICENSED LWR PLANT MUST BE ABLE TO WITHSTAND FOR A SPECIFIED DURATION AND RECOVER FROM A STATION BLACKOUT.

2. STATION BLACKOUT DURATION SHALL BE BASED ON:

   (I) REDUNDANCY OF ONSITE EMERGENCY AC POWER SOURCES.

   (II) RELIABILITY OF ONSITE EMERGENCY AC POWER SOURCES.

   (III) EXPECTED FREQUENCY OF LOSS OF OFFSITE POWER.

   (IV) PROBABLE TIME TO RESTORE OFFSITE POWER.

3. USE OF ALTERNATE AC POWER SOURCES IS AN OPTION PROVIDED CONDITIONS STATED IN THE RULE ARE MET.

4. RG 1.155 PROVIDES GUIDANCE FOR COMPLYING WITH THE RULE.

REVIEW PRIORITIES

BASED ON RELATIVE SAFETY SIGNIFICANCE

- SUSCEPTIBILITY TO STATION BLACKOUT (~17 UNITS)

OTHER FACTORS

- ALTERNATE AC SOURCE PROPOSALS
- MARK 1 AND ICE CONDENSER CONTAINMENTS

SBO REVIEW PROCESS

THE STAFF REVIEW WILL ASCERTAIN THAT THE GUIDELINES OF RG 1.155 HAVE BEEN IMPLEMENTED. THE REVIEW WILL FOCUS ON:

- THE DETERMINATION OF THE PROPOSED MINIMUM ACCEPTABLE SBO DURATION
  - OFFSITE AC POWER CHARACTERISTICS
  - ONSITE EMERGENCY AC POWER CHARACTERISTICS
  - EMERGENCY DIESEL GENERATOR RELIABILITY
- SBO COPING CAPABILITY
  - DECAY HEAT REMOVAL
  - EQUIPMENT ENVIRONMENT INCLUDING CONTROL ROOM
- POTENTIAL MODIFICATIONS
  - ALTERNATE AC SOURCE
  - REACTOR COOLANT PUMP SEAL FAILURE
  - BATTERY CAPACITY
  - CONDENSATE STORAGE CAPACITY
- PROCEDURES AND TRAINING FOR SBO
- OPERABILITY REQUIREMENTS FOR SBO EQUIPMENT

NRR SBO REVIEW AND IMPLEMENTATION SCHEDULE