NUCLEAR REGULATORY COMMISSION

In the Matter of: ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
SUBCOMMITTEE ON ELECTRICAL SYSTEMS

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

ELECTRICAL SYSTEMS SUBCOMMITTEE

Nuclear Regulatory Commission
1717 H Street, N. W.
Room 1046
Washington, D. C.

Wednesday, July 22, 1981

The subcommittee convened at 2:00 p.m., pursuant to notice, William Kerr, Chairman of the Subcommittee, presiding.

ACRS MEMBERS PRESENT:

W. KERR

ACRS CONSULTANTS PRESENT:

P. DAVIS
W. LIPINSKI
Z. ZUDANS

NRC STAFF MEMBERS PRESENT:

S. AGGARWAL
D. SULLIVAN
AL HINTZE
E. WENZINGER
Z. ROSZTOCZY
D. FISHER
G. BAGCHI

DESIGNATED FEDERAL EMPLOYEE:

R. SAVIO

P R O C E E D I N G S

MR. KERR: The meeting will come to order. This is a meeting of the Advisory Committee on Reactor Safeguards Subcommittee on Electrical Systems.

My name is William Kerr.

The ACRS consultants present today are Mr. Davis, Mr. Lipinski and Mr. Zudans. ACRS staff members present include Mr. Fisher and Mr. Savio who is also the designated federal employee.

The purpose of this meeting is to review a proposed rulemaking titled "Environmental and Seismic Qualification of Electric Equipment Important to Safety for Nuclear Power Plants." Accompanying this rule is a proposed revision to Reg. Guide 1.89 titled, interestingly enough, "Environmental Qualification of Electrical Equipment Important to Safety for Light Water Cooled Nuclear Power Plants."

The meeting is being conducted in accordance with the provisions of the Federal Advisory Committee Act, I think, and the Government in the Sunshine Act.

Rules for participation in today's meeting have been announced as part of the notice of the meeting published in the Federal Register on July 8, 1981.

A transcript of the meeting is being kept and will be made available by July 29, '81, as stated in the Federal

Register notice.

It is requested that each speaker identify himself and use a microphone so that his undying words can be appropriately recorded.

We have allocated time on the schedule for presentations from interested members of the public. At this point I am supposed to ask if there is anyone who would like to make such a presentation.

Is there?

(No response.)

MR. KERR: I see no hands at this point so I will assume that nobody wants to make a public presentation unless I hear to the contrary.

We will proceed with the meeting. The first part of the procedure I guess is for me to ask if any of my esteemed colleagues want to make any additional statements at this point?

(No response.)

MR. KERR: I see no indication that they do so I will turn things over at this point to Mr. Sullivan of the NRC staff.

Mr. Sullivan.

MR. SULLIVAN: Thank you, Dr. Kerr.

At this point I think it might be a good idea if I introduce the people here at the table from the staff.

To my immediate right is Mr. Satish Aggrawhl of the Electrical Engineering Branch, Office of Nuclear Regulatory Research. he was the task leader for the rule.

I am Don Sullivan. I am Acting Chief of the Electrical Engineering Branch.

To my immediate left is Al Hintze who is the task leader for the regulatory guide and he is a member of the Instrumentation and Control Branch in the Research Office.

To his left is Ed Wenzinger who is the Chief of the Instrumentation and Control Branch.

To his left is Zoltan Rosztoczy who is Chief of the Equipment Qualifications Branch at NRR.

There are also a number of other people from the staff that I won't take the time to introduce but they are down here to assist us in the overall presentation of the rule to the committee.

At this time we would like to make a presentation to the committee. Mr. Aggarwal has prepared a presentation. So if we may, I will turn it over to Mr. Aggarwal.

MR. AGGARWAL: Good afternoon, Mr. Chairman. My name is Satish Aggarwal.

At the outset I would like to explain the need for the proposed rulemaking on equipment qualifications.

As you know, the current general requirements for qualification of electric equipment important to safety are found in general design criteria 1, 2, 4 and 23 of Appendix A to Part 50, Sections 3 and 11 if Appendix B to Part 50, and 10 CFR 50.55(a), subparagraph (h).

The NRC has used several methods to ensure that these general requirements are met for electric equipment important to safety.

For the oldest plants qualifications were based on the fact that electric components were of high industrial quality.

For plants after 1971 qualification was judged on the basis of IEEE 323-1971. However, no regulatory guide was ever issued endorsing IEE 323-1971, although some of the plants, as I recall, made references to different standards in their FSARs.

For plants whose safety evaluation reports were issued after July 1, 1974, the Commission had issued Regulatory Guide 1.89 which, in most respects, endorses IEEE 323-1974.

Currently the Commission has underway a program to re-evaluate the qualification of electric equipment important to safety in all operating reactors. As a part of this program the staff has developed more definite more definite criteria for the environmental qualifications.

In 1979 DOR guidelines were issued. In addition, the staff has issued NUREG 0588. In its memorandum and order CLI 80-21 issued on May 23, 1980, the Commission endorsed the staff action to use the DOR guidelines to review operating plants and NUREG 0588 to review the problems under licensing review.

Further, the Commission ordered that these two documents, namely, DOR guidelines and NUREG 0588, form the requirements that licensees and applicants must meet in order to satisfy those aspects of Appendix A that relate to the environment qualification of electric equipment important to safety.

The Commission directed the staff to proceed with the rulemaking on environment qualifications of electric equipment.

Mr. Chairman, as you know, these specific methods for qualification of electric equipment have not been explicitly codified as requirements in an NRC regulation. The purpose of the proposed rule is to codify the current NRC practice with respect to qualification of electric equipment important to safety.

The proposed rule will apply the same uniform criteria to all operating nuclear power plants and plants for which application has been made for a construction permit or an operating license. Upon publication of the final rule, the DOR guidelines and NUREG 0588 will be withdrawn.

Mr. Chairman, the regulatory guide 1.89 has been revised to provide guidance on methods acceptable to the NRC staff for meeting the requirements of the proposed rule. Both of these documents, the proposed rule and the proposed revisions to Regulatory Guide 1.89, are being presented to you this afternoon for your review and comments.

With this introduction, let me state the highlights of the proposed rule first.

(Slide presentation.)

The proposed rule, Section 50.49, will be included as an amendment to 10 CRF 50 which will read "Environment and seismic qualification of electric equipment important to safety for nuclear power plants."

Mr. Chairman, as you see, the proposed rule covers both environmental and seismic qualifications of electric equipment important to safety.

The next slide, please.

Electric equipment important to safety means those electrically operated, actuated or energized components necessary for the proper operation of systems important to safety.

Such systems include systems required to mitigate the consequences of an accident and those systems whose failure of malfunction could cause an accident or cause an accident in process to worsen.

Next slide, please.

Included are systems required for reactivity control, systems required for reactor and process system heat control, systems required for containment isolation, systems required for maintaining containment integrity, systems required for preventing significant release of radioactive material to the environment, instrumentation essential for operator action in accomplishing one through five and equipment that could fail in such a manner that the failure would prevent the proper operation of equipment important to safety or mislead the operator.

The next slide, please.

A list of electric equipment important to safety shall be prepared and maintained in a central file. This list shall, as a minimum include three basic items: the performance characteristics; the range of voltage, frequency and other electrical characteristics; and the environmental conditions.

The next slide, please.

The qualification program shall include the following: known synergistic effects.

Mr. Chairman, please note that the key word is "known." Effects resulting from dose rates and from different sequences applying quantification test parameters are known today and should be accounted for in the qualification program.

No. 2, aging.

MR. KERR: I must say I am glad NRC is not requiring unknown synergistic effects to be listed.

(Laughter.)

MR. AGGARWAL: No. 2, aging. Aging considerations based on seismic and dynamic loads shall include a justifiable number of operating basis earthquakes and other dynamic cyclic loading effects.

The next slide, please.

Other factors are margins, temprature and pressure, humidity, chemical effects, radiation, submergence and seismic and vibratory loads.

With regard to margins I would like to state that the margins should:

(a) account for uncertainties associated with the use of analytical techniques in deriving environmental parameters when best estimate methods are used.

(b) should account for uncertainties associated with defining satisfactory performance, for example, where only a few units are accepted.

(C) account for variations in the commercial production of the equipment.

(D)account for the inaccuracies in the test equipment to assure that the calculated parameters have been adequately enveloped.

Each item of electric equipment important to safety shall be qualified by one of the following methods:

(1) Testing an identical item of equipment.

(2) Testing a similar item of equipment with a supporting analysis to show that the equipment to be qualified is acceptable.

(3) Experience with identical or similar equipment under similar conditions with a supporting analysis to show that the equipment to be qualified is acceptable.

(4) Analysis alone, subject to the approval of the NRC staff in the following cases:

(i) Type testing is precluded by the physical size of the equipment or by the state of the art;

(ii) the equipment was installed prior to May 2 , 1980.

The next slide, please.

Installed electric equipment important to safety shall be subjected to adequate programs of preventive maintenance and quality assurance, including routine maintenance to minimize dust accumulation that could degrade the ability of the equipment to function properly.

A record of the qualification shall be maintained in a central file to permit verification.

At this time to Revision 1 to the Regulatory Guide 1.89 and the highlights.

The next slide, please.

MR. KERR: According to my watch you have read to us now for about five minutes material which I think we have. I don't object to that if you think that is a most efficient use of your time, but an alternative might be to refer to the written material and select those things that you think require emphasis because I assume that not everything written here should have equal emphasis.

MR. AGGARWAL: That is true and this is what I propose to do for the Regulatory Guide 1.89, sir.

With regard to Revision 1 to the regulatory guide, the scope of the guide is changed to include qualification of all electric equipment important to safety and not just Class IE equipment.

MR. KERR: Wait a minute. Where do I find that?

MR. AGGARWAL: This is the title of the guide now, 1.89, which as previously issued applied only to Class 1E equipment.

MR. KERR: Now it applies to equipment important to safety?

MR. AGGARWAL: That is right.

It is the staff position that Class 1E is a subset of equipment important to safety.

MR. KERR: I am sorry, is a what?

MR. AGGARWAL: It is a staff position that Class

1E is a subset of equipment important to safety.

MR. KERR: Thank you.

MR. AGGARWAL: Guidance is also provided in establishing containment pressure and temperature envelopes inside containment for a LOCA. It is noted that high pressure is not necessarily a limiting condition.

Guidance is also provided in establishing containment pressure and temperature for a main steamline break.

Guidelines for chemical spray solutions are provided.

These are contained in SRP Section 6.52. It should be noted that for plants which use demineralized water as a spray solution, the effect of the spray should also be considered.

The next slide, please.

The radiation source term has been updated based on the TMI-2 experience and guidance in using that term is provided.

For a LOCA where the break cannot be isolated we have provided a composition, and also for a LOCA where the break can be isolated and for all other design basis accidents.

The next slide, please.

A source term to be used in the qualification of certain high-range accident monitoring instrumentation is also provided.

Acceptable of fractional release for each group is given in the regulatory guide.

Equipment located outside containment exposed to a recirculating fluid system ---

MR. KERR: Excuse me. Is that wording sequence the word the one you had intended, rather than "an acceptable fraction of"?

MR. AGGARWAL: Sir, would you repeat the question.

MR. KERR: It would appear to me that the head might be "Acceptable fraction of" rather than "Acceptable of Fractional."

MR. AGGARWAL: Yes, sir. That is a typing error. You are right.

MR. KERR: Thank you.

MR. AGGARWAL: Equipment located outside containment exposed to a recirculating fluid system should be qualified to withstand the radiation equivalent to that penetrating the containment, plus the exposure from the recirculating fluid.

Equipment that may be exposed to low-level radiation doses, below ten to the fourth power rads, should not be considered to be exempt from radiation qualifications unless analysis supported by test data or operating experience is provided.

The next slide, please.

Guidance in establishing environmental conditions outside containment is provided.

The staff position in qualifying equipment in a mild environment is that testing is not required.

Design/purchase specifications which contain a description of functional requirements of its specific environmental location duirng normal and abnormal environmental conditions will generally be acceptable.

Recently, Mr. Chairman, the staff met with approximately 600 representatives from utilities, industries and A&Es. We presented the proposed rule and the proposed revisions to the regulatory guide at this meeting. At this meeting we learned that there was a confusion about the meaning of mild environment.

They started therefore proposing to add the following definition on a mild environment.

The next slide, please.

At this time I would like to pass over ---

Yes, sir.

MR. ZUDANS: I have one question on this slide. I just wanted to make sure that Item VIII only refers to environmental qualifications and not seismic testing.

MR. AGGARWAL: That is right. I am going to have a definition.

Could you please pass this definition over to the other members.

(The "definition" was distributed.)

MR. AGGARWAL: The proposed definition is: A mild environment is an environment that, under any postulated accident condition, would be no more severe than the environment that would occur during normal power plant operation or during anticipated operational occurrences.

At this time, Mr. Chairman, I would like to invite your attention to page 9 of the rule, Enclosure A.

MR. KERR: This is page 9, Appendix A?

MR. AGGARWAL: Of Enclosure A.

MR. KERR: I have an Appendix A entitled "Methods for Calculating." Is it that?

MR. AGGARWAL: No, sir, this should be in the front of the whole package.

MR. SULLIVAN: It is in the rule proper, Dr. Kerr, Enclosure A.

MR. AGGARWAL: Page 9.

MR. KERR: Okay.

MR. AGGARWAL: Do all of the members have the right page now?

MR. KERR: It begins "Testing on identical item of equipment?

MR. AGGARWAL: That is right.

Under paragraph (e) of (4) with begins with "Analysis alone," does everybody have that?

Okay, the line two reading "Prototype equipment is not available" will be deleted for clarity.

It may also be noted that some editorial changes will be made prior to the publication of the proposed rule and the guide.

Now, I would like to answer the question of replacements parts.

Components which are part of equipment qualified ---

MR. KERR: Are you referring now to some part of the publication, or is this separate?

MR. AGGARWAL: This is included, sir, in the 1.89.

MR. KERR: What page?

MR. HINTZE: It is in the implementation section. I believe it is 17 or 18. Page 17.

MR. AGGARWAL: Thank you, Al.

Components which are part of equipment qualified as an assembly, for example, in a motor starter which is a part of a motor control center qualified as a whole, may be replaced with components of the same design. If compoinents of the same design are not used for replacement, the replacement component should be designed to meet the performance requirements and be qualified to meet the service conditions specified for the original components.

Mr. Chairman, I would like to point out that there are no outstanding technical issues among the NRC staff, namely, the Office of Nuclear Research, NRR and I&E related to the proposed rulemaking package presented to you today.

MR. KERR: Are there any outstanding nontechnical issues?

MR. AGGARWAL: No, sir.

MR. KERR: What is meant by that statement that you just read where you said components which are part of equipment may be replaced with components of the same design if components of the same design are not used for replacement? What does "of the same design" mean?

MR. AGGARWAL: Same means a similar design.

Dr. Rosztoczy, would you like to explain or expand on that issue?

MR. KERR: If I were trying to apply this rule I wouldn't know what was met by the statement. It is hard for me to see that something can use as a replacement part something that isn't of somewhat similar design or otherwise it is not a replacement part. So I don't know what the meaning of the same design is. How does a person who is buying replacement parts interpret that? I don't know what the staff hand in mind and that is what I am trying to find out.

MR. ROSZTOCZY: It appears to me, Dr. Kerr, that probably some improvement in the wording in that area would be useful. Basically what we are saying is that if you are replacing an equipment that has been qualified as a unit with another equipment, then that equipment also has to be qualified.

But if you are replacing a subcomponent from a unit that was qualified, then you can replace it with another subcomponent provided the requirement under which the subcomponent was manufactured and tested meets the requirements that the previous component satisfied.

MR. KERR: That is probably very clear to people who have to make the rule work. It just seems to me that one could avoid this ambiguity by saying replacement parts have to be qualified. What do you miss when you say that?

MR. ZUDANS: The issue is that they don't have to be qualified specifically provided that they are designed by the same rules.

MR. AGGARWAL: The same specification, if I might say.

MR. ZUDANS: They are trying to make it easier.

MR. KERR: All of this testing is prototype testing. You don't test the individual items before they go on the shelf. You do prototype testing. So it seems to me if you say that a replacement part has to be qualified, I don't see what this is saying other than that.

MR. AGGARWAL: I don't have.

MR. ROSZTOCZY: I don't have in front of me the words, but basically what we are saying is that if you are replacing a certain piece of equipment, then you are right, the new one has to be qualified. If you are repairing an existing piece of equipment, let's say you are changing a resistor inside a piece of equipment, then you do not have to go back and requalify the entire equipment just because you replaced the resistor.

MR. KERR: Why not simply say that if you use a replacement part the replacement part has to be qualified? There must be something I am missing and there probably is.

MR. ROSZTOCZY: We have received many, many questions during the past year of what is an acceptable qualification for the replacement part. Does it mean that now they have to send the whole equipment out again and qualify it? Does it mean that the replacement part has to be sent out and has to be qualified to all the various environmental conditions which are specified in the plant analysis or is it enough to replace it with a part that meets the same standards as the part that was there originally?

MR. KERR: But what does qualified mean if it doesn't mean that? If it meets the same standards it is qualified, isn't it?

MR. HINTZE: Actually, Dr. Kerr, we do state that if you will look at Item 3 under implication. Replacement components or spare parts used to replace presently installed equipment or components should be qualified to existing standards unless there is sound reasons to the contrary. What we have tried to do in this implementation is cover everything from plant one to all future plants.

Does that help?

MR. WENZINGER: The problem I think you are wrestling if the fact that when you qualify a piece of equipment to start with you don't take out each individual piece like individual resistors and so forth. You qualify the entire assembly. The problem comes out if you don't replace the entire assembly.

MR. KERR: But even when you qualify the whole assembly, at least if I understand this, and I probably don't, you don't run every one of these pieces of equipment through testing. You do a prototype testing, don't you?

MR. WENZINGER: That is correct.

MR. KERR: Now, once you have tested the prototype then everything else that is like that presumably is qualified.

MR. WENZINGER: That is correct. But you it if you are not replacing the entire assembly but only a piece of it.

MR. KERR: Look, if I take out resistor "A" and replace it by resistor "B" which is exactly like resistor "A" then it seems to me I will still have the same equipment as far as qualification is concerned.

MR. WENZINGER: We agree.

MR. KERR: So I don't see what one would lose by saying that replacement parts must be qualified.

MR. WENZINGER: Because replacement parts were not qualified in an individual test to start with.

MR. KERR: It seems to me that by implication they were because were they not able to resist the environment or aging or whatever they would have by nature disqualified the whole system.

MR. WENZINGER: That is correct.

MR. ROSZTOCZY: Dr. Kerr, you are absolutely right that they have to be qualified. That is fine. But then we have received a number of questions of what does it have to qualify to. We are trying to address the second part also.

Let me take an example. Let's assume that the equipment is exposed to a certain temperature environment which reaches 300 degrees for some time. So when you qualify the whole equipment you expose it to a similar temperature environment. If there is a transistor somewhere inside this equipment that transistor might not see anything more than 150 degrees because it is inside the equipment and the temperature inside didn't reach higher variants. But it was not qualified to a specific curve. It was simply bowed to some general specification.

What we are trying to say is that this transistor can be replaced by another one provided the specification written for the new is not more lenient than the specification that was written for the original part. This provides just a little extra information beyond what you are looking for.

MR. KERR: It seems to me that the second sentence does require the qualification of the individual component when it is not of the same design. Or does it?

MR. ROSZTOCZY: It requires only a design specification which is at least as stringent as it was for the original part.

MR. KERR: Well, it says it should be designed to meet the performance requirements and be qualified to meet the service conditions. Now if being qualified doesn't mean being qualified, what does it mean?

MR. ROSZTOCZY: Yes, in that sense certainly. They means that normally when they, for example, manufacture transitors then they are going to check that it meets the design requirements, yes.

MR. KERR: So qualifie_ in tha: sentence doesn't mean the same thing as qualfied in the first sentence where you talk about qualified as an assembly. Qualified there just means it is designed?

MR. ROSZTOCZY: The assembly is exposed to the conditions that you would expect to see in the plant. A subcomponent can be designed to lower conditions than this because it is inside of an equipment and might not be exposed.

Through the original testing it was established that the subcomponent which was designed, let's say, to a lower temperature level, survived the actual test of the equipment. Because of this if you put in a new component, which is at least as good as the old one was, then there is no need to requalify the equipment. It is enough only to test and assure that the new piece meets the same design requirements.

MR. ZUDANS: I think the word "qualified" is used twice in different contexts. The first time qualified to the standards really means that it satisfies the standards for design. When you use the word "qualified" in a much braoder sense you qualify it to the environmental conditions in the plant. I think those words should not be used in that way.

When you say here "qualified to the existing standards," you had better say the words "satisfies the existing standards" or "complies with the existing standards," or any other word other than "qualified."

MR. ROSZTOCZY: I think we are in full agreement with the comment that some improvement in the wording of this paragraph would be helpful.

MR. AGGARWAL: Let me put it this way. We actually attempted to clarify hundreds of questions that were posed to us in the past few years and it seems the words have created some confusion. I will be willing to reword and modify to convey what has been discussed here.

May I proceed further?

MR. KERR: Go ahead, sir.

MR. AGGARWAL: Dr. Kerr, finally let me discuss the impact of this rule on the industry.

MR. KERR: I am sorry, the impact of?

MR. AGGARWAL: Of this rule, proposed rule on the industry.

MR. ZUDANS: Could we look at your redefinition of mild environment?

MR. AGGARWAL: Sure.

MR. ZUDANS: I don't have any qualms with it. I know what you mean by it. I am just wondering whether the last three words, "anticipating operational occurrences," are uniquely defined. That is liable to put you in trouble more than the others.

What you are saying is that a mild environment now is the one -- no, that is different. I guess the AIF's position is different, the rules. Can "anticipated operational occurrences" be precisely defined so that we really know ---

MR. SULLIVAN: In Appendix A to Part 50 it is in fact defined.

MR. KERR: I don't see what the parenthetical phase has to do with it. If I understand it, and again I may not, it would mean the same thing if one said a mild environment is an environment that would be no more severe than, because I think that is what it means. So I don't see why one puts in that qualifying phrase "under any postulated accident condition.

MR. ROSZTOCZY: Dr. Kerr, the dividing is a little bit different in that we are saying what the conditions are, what the actual numbers are, temperature and radiation also. That is not the dividing line but whether the conditions that the equipment experiences after an accident is unusual.

If there is an equipment which is always at 200 degrees, operates always at 200 degrees ---

MR. KERR: Are you telling me what it is that you are trying to say or what you think that sentence says?

MR. ROSZTOCZY: Both.

MR. KERR: Okay.

MR. ROSZTOCZY: The approach is that equipment which would be exposed following an accident to similar environmental conditions, that it is being exposed during the operation of the plant either as a normal operation or through operational transients that we expect the plant is going to see, for example, lots of power, then there is no need to have necessarily separate qualification testing but qualification by experience could be used.

Therefore, it doesn't matter what the temperature is. If it is always at the temperature we don't expect the equipment to fail under the same conditions like after an accident.

On the other hand, if there is ---

MR. KERR: I sure don't see all that in that sentence.

MR. ROSZTOCZY: It is all there, it is just very concise.

(Laughter.)

MR. KERR: Take out that phrase "under any postulated accident condition" and read it and tell me what is missing. If you tried "A mild environment is an environment that would be no more severe than the environment that would occur during normal power plant operation or during anticipated operational occurrences," what is missing when you read it that way?

MR. SULLIVAN: What is missing is a particular time. We are saying that at the particular time of a postulated accident for which that equipment must operate.

MR. KERR: Look, if you are talking about an environment that would occur during normal power plant operation or during anticipated operational occurrences you aren't talking about an accident.

MR. SULLIVAN: That is correct.

MR. KERR: Now it says a mild environment is an environment that would be no more severe than the environment. If you are talking about under any postulated accident conditions, that is not during normal power or anticipated operational occurrences.

MR. SULLIVAN: Well, the idea we were trying to get across was that if you had a postulated accident, and let's take an extreme case, a LOCA accident. Okay, then in the control room there would not be, for example, any change in environment. So the equipment would not be subject to any potential common mode failure at the time.

MR. KERR: My suggestion of taking out the phrase certainly wouldn't interfere with the meaning there.

MR. SULLIVAN: I think what we can do is simply say that at no time it would be any more severe or something like that.

MR. KERR: Tell me what you leave out by just throwing out that phrase? What is it you neglect?

MR. SULLIVAN: I don't think we leave anything out that is ---

MR. KERR: I am not trying to tell you what you want to say. I am trying to understand what it is you are saying.

MR. HINTZE: Let me ask this question. If we left it in does it cause confusion?

MR. KERR: Well, it causes confusion because usually when I see a phrase that involves two, four or five words I think it is supposed to carry some meaning and it doesn't carry any meaning to me if what you mean is that the environment is the environment you see during normal operation or anticipated transients.

MR. SULLIVAN: All all times. At all times during plant operation, including an accident, then that is correct. The idea is that the postulated accident condition does not impact upon the equipment that has to operate.

MR. KERR: It seems to me you either have an accident or you don't have an accident. Now, is the environment we describe as mild the environment you have during normal operation or during an accident?

MR. SULLIVAN: It is both. The environment we are talking about,for example, in the control room ---

MR. KERR: If you are saying that this is an accident that does change the normal environment, then it seems to me you cover everything by saying the environment is the one that you see during normal operation.

MR. ROSZTOCZY: Dr. Kerr, the emphasis is on following a major accident like a loss-of-coolant accident. There may be parts of the plant that will experience quite different environments than previously, but there will be some parts of the plant which will not experience such an environment.

MR. KERR: I am with you up to now all the way.

MR. ROSZTOCZY: So the emphasis is even in case of a major accident, if the environment doesn't experience more than it previously did ---

MR. KERR: I understand that. But now let's ask how do I describe that environment that doesn't experience any change. It seems to me that I can describe it by saying it is the normal environment that the plant sees during normal operation.

MR. AGGARWAL: We can say that.

MR. SULLIVAN: We agree.

MR. ZUDANS: There is just one problem.

MR. KERR: Maybe I am missing something subtle.

MR. ZUDANS: I think what they are trying to do is they are trying to say that there could be accident conditions that could be considered as normal environment in certain areas. A mild environment is such as found during normal operation and anticipated operating occurrences. Then there could be accidents where they environment does not deteriorate. So you want to allow to be able to talk about a mild environment even in those accident cases. That is why that "under any postulated accident condition."

MR. KERR: But what environment do you have when you have that accident? The environment is the normal environment.

MR. ZUDANS: That is correct.

MR. AGGARWAL: Dr. Kerr, I am convinced that the words "under any postulated accident condition" do not convey any significant meaning or contribute anything to the definition. We therefore will be willing to delete it.

MR. ZUDANS: Now wait a minute.

(Laughter.)

MR. ZUDANS: You are going to be in trouble because they are not going to allow any accident conditions to be treated as mild environment and you cannot live with that.

MR. AGGARWAL: No, that was not intended. What we are saying is a mild environment is an environment that would not be more severe at any time than the environment that would occur during the normal plant operation. The words "at any time" should take care of the definition.

MR. ROSZTOCZY: At any time including the accidents.

MR. AGGARWAL: Is that a happy compromise?

MR. KERR: I think I understand what you are saying.

MR. AGGARWAL: Thank you.

MR. KERR: That is an interesting definition of mild but I will accept it since you provide it.

MR. SULLIVAN: It is a slight misnomer, quite frankly. It really has to do with a change rather than how mild it is.

MR. LIPINSKI: May I suggest a two-part definition. One, is to define this milder environment as being the one that is there during normal plant operation or during anticipated operational occurrences and then you simply add another statement saying if under postulated accident conditions it does not change then it is qualified to the mild environment.

MR. KERR: That requires another reg. guide.

(Laughter.)

MR. LIPINSKI: It simply separates into two parts, two thoughts into two pieces, namely, defining the mild environment and then continuing that the postulated accident condition if the environment doesn't change then it is still qualified to the mild environment.

MR. KERR: Good point.

MR. HINTZE: Well, that presents a problem because it might change but not beyond an anticipated operational occurrence.

MR. LIPINSKI: That is what you are saying.

MR. HINTZE: Well, you can't just say that it doesn't change. You would be in trouble if you just said that.

MR. LIPINSKI: I have defined the mild environment. If I have an accident condition and the accident condition does not cause the environment to go beyond the mild environment, then it is qualified to the mild environment. The environment has been defined to include both of these cases.

MR. KERR: Good point.

Continue, please, sir.

MR. AGGARWAL: Thank you, Dr. Kerr.

Finally, let me discuss the impact of the rule on the industry.

The value of this proposed rule is that the industry will have clearly specified requirements to follow with respect to the qualification of electric equipment important to safety. This, in turn, should ease the licensing process for industry by eliminating delays resulting from misinterpretation of NRC's requirements.

If the final rule is published as presented to you today, the rule will have no impact on the industry because of backfit. The licensees are currently required to meet the provisions of the DOR guidelines and NUREG 0588 with respect to qualification of electric equipment by June 1982.

However, as a result of public comments, if the final rule is different than what is presented to you today, the rule may have considerable impact on the industry because of the backfit.

Mr. Chairman, finally I would like to point out that the staff is proposing to revise Regulatory Guide 1.100 in the near future. At that time we will address the question of aging prior to seismic testing.

Thank you.

This is the end of my presentation and if there are any questions we will be happy to answer them.

MR. KERR: Thank you, Mr. Aggarwal.

Does the staff have any more comments that anybody else wants to make at this point general in nature?

(No response.)

MR. KERR: Does anybody in the A&M corner have any?

(Laughter.)

(No response.)

MR. KERR: What I would propose then is that we go through this, but first I guess I should ask the consultants. Do you gentlemen have any general comments rather than specific comments on parts of the guide or the rule that you want to make?

(No response.)

MR. KERR: All right. I would propose then that we sort of do a page-by-page look at the rule and regulatory guide with any comments or questions as we go through it.

I think I have one question that I guess is general, Mr. Aggarwal. The statement you made was that this rule would have no impact on operating power plants because it really just codifies existing practice.

MR. AGGARWAL: Dr. Kerr, I stated the current NRC practice rather than the existing practice. When I am saying current ---

MR. KERR: What is the difference between current practice and existing practice? You are losing me here.

MR. AGGARWAL: At this time the applicants are required to meet the requirements laid down in NUREG 0588 and the DOR guidelines. The rule as presented to you and the regulatory guide presented to you, for example, the source term in respect to radiation is different as compared to NUREG 0588. There is a statement in the regulatory guide that as the research progresses and we find that certain changes are needed they will be made.

So my statement to you at this time is that the proposed rule as presented to you today will not have any impact if those requirements which are laid down in the DOR guidelines and the NUREG 0588 are met. Should there be a change in terms of source term or any other changes which we may have to make as a result of public comments, then definitely there will be some impact.

MR. KERR: I guess it would be helpful to me in sort of judging what it is we are trying to accomplish if I knew why this rule was deemed necessary by the staff. Has the staff seen in operating experience up to date a lot of difficulty because electrical equipment was not properly qualified or has there been a lot of misunderstanding or do you see existing or potential situations in which lack of qualification is likely to cause a great deal of difficulty?

MR. AGGARWAL: That is correct, Dr. Kerr.

MR. KERR: I am sorry, what is correct?

MR. AGGARWAL: That we had problems?

MR. KERR: Have you had licensing problems or safety problems? The two are different in my mind.

MR. AGGARWAL: Dr. Rosztoczy, at this time would you like to state the position of NRR?

MR. ROSZTOCZY: Dr. Kerr, we have recently completed a review of the equipment qualification status of all the operating plants. This included somewhat more than 70 plants.

MR. KERR: Dr. Rosztoczy, I guess I didn't ask my question well. It is one thing to go through and find out what the records in the plants show. My question was have plant experiences, breakdowns of equipment, lack of operation, whatever, convinced you that existing equipment is in bad shape and that it needs to be improved and that the way to improve it is to inaugurate this program?

MR. ROSZTOCZY: There have been some failures, but you have to recognize that the main work which has been done for the harsh environment covers loss-of-coolant accidents, steamline break and feedline break accidents. These are not events that we expect to see in the plants. We have seen very few of them. So the experience coming from operating plants is very limited because of this.

We have experienced a much larger number of failures in qualification tests which are designed to assimilate these events for the purpose of qualifying the equipment. We have seen a fair number of failures in the tests and we have seen some failures in the actual plant cases.

MR. KERR: So the large LOCA situation is the one that gives one most concern about the possible operation of electrical equipment?

MR. KERR: In terms of temperature it would be the large LOCA and the large steamline break. Usually the LOCA is a little bit higher. In terms of radiation one of our main concerns was whether equipment which is close to the circulating fluid lines is properly qualified for the environmental conditions.

MR. KERR: Okay. Now, a second question is has there been any effort on the part of Standards or whoever to look at this program and estimate the decrease in risks that it is likely to produce?

MR. SULLIVAN: Not on the part of the Office of Research. There is no more Office of Standards. I just want to make that point. In the Office of Research, no, as far as I know there has been effort to quantify any decrease in risks.

MR. KERR: I think everybody involved agrees that this is going to cost a lot of money. It would seem to me that one would want to have some general idea that one would predict a concomitant decrease in risk. Indeed, I was puzzled when I read the value impact statement that no mention was made of this other than a passing statement that the public health and safety would be enhanced by this rule.

I would have expected that one might ask somebody to try to balance the risk decrease that was being bought by what I would guess might be quite a lot of money. Is this going to be pretty expensive?

MR. SULLIVAN: Yes. To implement the entire program that Dr. Rosztoczy has underway, yes. All I can say is that in Research we have not done any such study. We have done simply I guess a rather crude qualitative study that the more assurance that you have that equipment is qualified, the more assurance you have of safety, but that is it.

MR. KERR: It just seems to me, for example, a study of this kind might be helpful in order to establish emphasis in the search of things that one would do first. I don't have to remind you because you are faced with this every day that we are asking people who operate plants to do a lot of things and they can't do them all simultaneously. This may be an extremely high priority need or it may be a low priority need.

It would seem to me that one would need to have some information of that kind in order to know something about resource allocation.

MR. AGGARWAL: Dr. Kerr, by presenting this rule and going to the public for their comment it will give us also some idea as to what in fact they will feel. At this time all we are asking you is go along with us to have it published for public comment.

MR. KERR: Well, one of your responsibilities, according to what I read here, is some sort of rational effort to estimate the risk and the benefit associated with the rule change. What I see in here is pretty cursory. It says it is going to cost a lot, which could to me mean anything from $10 to $10 million. I don't know which order of magnitude we are talking about. It says the public safety will be improved.

Now, I think for an organization as sophisticated as the Nuclear Regulatory Commission now is one could expect a little more quantitative description. I would think in allocating your own resources you would want a more quantitative idea of what is being accomplished.

MR. AGGARWAL: I think, Dr. Kerr, you have a valid point. But may I point out to you, sir, that all nuclear power plants at this time are required to meet these requirements under the Commission order.

MR. KERR: Well, the Commission could be exactly right and it could be wrong. If it is wrong it will never know it until its staff tells it that it is because the technical capability in the Commission and the time available is not such that they can make decisions like this unless they have input from people who are experts and that is you guys.

MR. HINTZE: The requirements that are included in this are no different from what has been required since 1974.

MR. KERR: This may be, but I see a rule, and to me a rule says that either you have had difficulty getting people to do this and so you need to get them to do it or something. I guess I don't take altogether seriously a statement that says we are not doing anything different but we have to have a rule.

My response to that is if you are not doing anything different then why do you need a rule because everybody is busy and it takes a good bit of effort to put it together and get adopted. So there must be some reason for doing it.

MR. HINTZE: I don't think the question has been answered directly then because we have been talking about should we qualify at all versus let things go as they have been.

MR. KERR: Or how much should you qualify?

MR. HINTZE: You are saying why do you need a rule to do what we are asking them to do.

MR. KERR: Well, I am not sure that I am asking the right question. You figure out the question I should have asked.

MR. SULLIVAN: Well, as I understand your question it is how much quantitative risk decrease has there been or will there be by virtue of the rule.

MR. KERR: And how much is it going to cost the people who are decreasing the risk?

MR. SULLIVAN: I don't know that I can commit NRC to this, but we understand your comment, Dr. Kerr, and we will take it under advisement.

MR. KERR: Okay.

MR. ZUDANS: I would like to make a small comment. I think that you have to look at the fact that we are talking about equipment that is required to assure that the accident consequences are not worse than they are predicted. If any of this equipment fails the risk increase will be dramatic without any analysis.

MR. KERR: Well, now, for example, I would have assumed that the Rasmussen study would have given some thought to this. Maybe they just ignored it and assumed that everything worked. I don't know. If one could point out and say, hey, the Rasmussen study is off by a factor of ten because they didn't take this into consideration, and if we do now qualify we have decreased risk by a factor of 10 or 100 or whatever. That is a quantitative argument. It may not be valid, but I would understand it. I don't see anything like that in here.

MR. ZUDANS: You have to go the other way. You are not going to decrease the risk by qualifying. You are going to dramatically increase the risk if you don't qualify.

MR. KERR: No. You are not going to increase the risk if you don't qualify because it is sitting there not qualified. The fact, by the way, that it is sitting there doesn't necessarily mean it won't work. It just means we don't know. It probably means some of it won't work.

It may be that the question I am asking is impossible to answer. I think you are telling me you are haven't really looked at it very much and there are a lot of reasons maybe why you wouldn't.

MR. SULLIVAN: We have looked at it in the qualitative manner in that the more you qualify to the presently known technology the better off you are quite obviously. It also it wants you to ensure that the equipment that is there is qualified. Of course, it does apply to future equipment that is not just sitting there. Then you have to qualify it to be sure it will work. We don't have any numbers but we will look into this.

MR. KERR: Well, other general comments?

(No response.)

MR. KERR: Let's go then to the rule itself and I will start on page one of the proposed rule and ask if there are any comments on page one or two or three?

(No response.)

MR. KERR: Page 4?

(No response.)

MR. KERR: Page 5?

(No response.)

MR. KERR: Under the part (b) of, what is it, paragraph something or other, the "Regulatory Flexibility Statement", "Electric equipment important to safety." Have you had any comments during the meeting with those with whom you have met about the ability, given that statement, to identify equipment that needs to be qualified? Will people, given that statement or whatever additional guidance is in the regulatory guide, know which equipment needs to be qualified and which doesn't?

MR. AGGARWAL: I don't understand the question.

MR. KERR: I am looking at page 5, paragraph (b) which defines electrical equipment important to safety. I am askin can a plant operator, given this guidance, go in and pretty readily pick out which is and which is not required to be qualified or does he have to have additional guidance through some sort of learning process in which he sends in the stuff to qualify and then somebody just stands and looks and says, no, that is not enough. We really think these ought to be qualified, too.

MR. ROSZTOCZY: This same problem has been faced in the ongoing reviews. The guidance given them, which was an I&E bulletin, namely 7901-B, provided a guidance letter similar to this one. The wording is not identical but very closely the same.

Each of the operating plants have identified a systems list listing of all those systems which they consider important to safety. That has been reviewed by NRC and was either accepted or it was suggested that additional systems be added to this.

So to answer your question, yes, there has been some difficulty and that is now in kind of the final phases of resolution. We hope to resolve those within the next few months.

MR. KERR: The way you find out is to have the plant operator make a list and then you look at it and you decide it either is or is not complete and if you approve it it is complete?

MR. ROSZTOCZY: Yes.

MR. KERR: That is sort of the way it works?

MR. AGGARWAL: Yes.

MR. KERR: So the next generation of reviewers might come up with a different list.

MR. ROSZTOCZY: No, because this is not established. This is for a given plant.

MR. KERR: No. I mean somebody comes in with a new plant and he has to do the same thing. A new reviewer now has to look and he won't be Rosztoczy but he will be somebody else or whoever does the reviewing.

MR. ROSZTOCZY: That is why the guidance is provided here which says the functions, the basic functions that you have to accomplish and the equipment which is needed for those basic functions if the one that has to be qualified. We tried to make a master list and we did that. We provided a master list as an attachment to the bulletin as a sample. But you cannot simply carry a master list over from one plant to another. Sometimes a given plant accomplishes a given function with a different system than another or they have a choice to accomplish it by more than one system and we are requiring them to qualify one of those systems.

MR. KERR: I don't think the task is easy and I would be surprised if this guidance were such that one could make a list. For example, No. 7, which strikes me as as being catch-all and I guess is deliberate. It says equipment that could fail in such a manner that the failure would prevent the proper operation of equipment important to safety or mislead the operator.

Now, if you can take any piece of equipment associated with a plant and get it outside No. 7, I would like to see you do it, which sort of says to me that any equipment associated with an operating nuclear power plant is equipment important to safety with which I don't necessarily disagree. But it seems to me that this list now leaves things up really to the discretion of the plant operator and the individual reviewer in choosing those equipments important to safety.

MR. ROSZTOCZY: That is correct. Especially the plant operator has the responsibility to look at very carefully his plant. You are absolutely right that especially item 7 is a very difficult one to handle.

MR. SULLIVAN: We have not attempted to have an exhaustive list or to define it all that precisely. In fact, this problem occurs even in such time-worn terms as protection systems that people can argue what goes into it.

MR. KERR: That fact that the problem exists doesn't mean that I am going to give up trying to solve it.

MR. SULLIVAN: The point I am trying to make is in most cases in determining what is to be, in fact in all cases, what has to be qualified or protection grade or whatever, is really based on an agreement, ultimately an agreement between licensee and the applicant.

I will grant that this does not give definitive guidance ---

MR. KERR: In a way, if that is the case, we don't need regulations. We just have the licensee and the applicant sit in a room with a reviewer and they come to an agreement and everything is okay.

The reason for rules, and I feel silly giving you this lecture, is to try to make things uniform. The more nearly one can make them uniform and objective, the more nearly everybody understands them I think.

MR. SULLIVAN: Well, I agree that overall the NRC should be as definitive as possible. The rule tends to be a little more general and I agree that other guidance could be issued on this such as reg. guides or other forms of communication. But the rule defines in a general way electric equipment important to safety.

MR. KERR: You see, I am an environmentalist and I love trees and I am trying to save all those trees out there that have to be cut down to provide the paper that I see flowing back and forth from licensee to applicant when a licensee gets a first round of questions, a second round of questions and a third round. You know, if you could somehow tell a licensee what he is going to be required to do the first time it would save a lot of your time and his time, too, I will bet.

MR. SULLIVAN: I will turn it over to Zoltan and see what he is doing on it.

(Laughter.)

MR. HINTZE: I think what Dr. Kerr is suggesting would be good if we had fixed plants and the designs didn't change. We then could name the systems. But how do you be so specific and yet cover plants which haven't been designed yet without designing them in here?

MR. KERR: The answer may be that you have everything qualified. But qualification doesn't mean the same thing for all sets of equipment. Now, you have done some of it already in some of your other considerations of equipment in effect that haven't come through yet. It may be time to face that. Maybe this rule is not the time to do it, but you know there may be grades of reliability and grades of qualification which one wants to use.

The reason I try to approach that is because if you use the same qualification for everything, even in this rule, it seems to me that you are probably going to overqualify things that don't need it. Now, I recognize a mild environment is a way out except again it is going to require this sort of negotiation between the staff and the licensee as to which pieces of equipment are in a mild environment.

MR. SULLIVAN: Well, the mild environment is no less a qualification that the device is 100 percent qualified for its environment. This is the kind of thing we can get into a philosophical point on here.

MR. ROSZTOCZY: Dr. Kerr, the intent here is to limit the qualification to a specific set of equipment which is far from being all of the equipment. Even though that No. 7 appears reasonably generous, it still limits it to a number of major systems needed for the safe handling of the plant. The qualification of the others would be needed to the extent that they don't interfere with these systems. For example, if they fail in a certain mode and that doesn't interfere with them, then no qualification is required.

MR. KERR: Zoltan, oth you and I understand this because we have talked about it and the people around the table understand it. The difficulty is that you and I are not going to be the ones that interpret this when the licensees come in and talk to licensing people. There are people who are going to have to interpret this who didn't write it and No. 7 is a pretty all-inclusive statement.

To be on the safe side most of the people tend to put in extra. If that is what you have in mind, okay, but No. 7 is prettv flexible, although I must admit the section is entitled "Regulatory Flexibility Statement" so maybe it should be.

MR. WENZINGER: Excuse me, Dr. Kerr, that is subsequent to the regulatory flexibility statement. That is actually a statement of the proposed wording to go into the regulations that begins on the top of page 5.

MR. KERR: Okay. That makes me feel better.

MR. WENZINGER: I am glad. I would like to point out that I personally had some discussions with the Institute of Electrical and Electronics Engineers and specifically with the Nuclear Power Engineering Committee's

Subcommittee on Qualification, Mr. Test if the chairman of that committee, on the subject of a graded approach to qualification and we have solicited their input on this subject which is yet to be forthcoming.

We are also engaged in our own activities within the Office of Research to pursue this matter. I believe the IEEE people can speak for themselves. If they have not reached the point where they are willing to make a specific proposal on that subject yet then neither are we. We recognize this is a possible solution to the problem you brought up and are pursuing it but we don't have an answer yet.

MR. KERR: Thank you.

MR. AGGARWAL: I might just add, Dr. Kerr, that if there are such studies are available we will be only happy to include that in Regul[illegible] Guide 1.89. I personally feel that this rule is not the place for it.

MR. KERR: Mr. Davis.

MR. DAVIS: Yes, I have a related question to the one you brought up on the same page, page 5, item (b). No. 3 under (b) is systems required for containment isolation. No. 4 is system required for maintaining containment integrity. Then No. 5 is system required for preventing significant release of radioactive material to the environment. I don't understand what could be in item 5 that isn't already covered in 3 and 4. Is there some other system that could cause a radioactive release to the environment? I presume you are talking about in this case environment is external to the containment. But if the containment is isolated and the integrity is maintained, what other systems are you worried about?

MR. ROSZTOCZY: If at any time after an accident you have to circulate through recirculating lines radioactive fluid outside the containment, then obviously some release from that would be possible provided there is no appropriate action taken. That would be typically what you would see under 5.

MR. DAVIS: All right, thank you.

MR. ZUDANS: On this same item 7, if you identify something that falls under 7, wouldn't that automatically become a system important to safety?

MR. ROSZTOCZY: Only to the extent so it will not interfere with the other systems. In other words, if you find a single component that is in another system the failure of which could interfere with one of the systems important to safety, then maybe the only thing you have to do is to handle that one single component and you don't have to go any further than that.

MR. ZUDANS: So essentially it would mean that a nonsafety related system or nonimportant system to safety may have components within it that are safety important.

MR. ROSZTOCZY: That could interfere with a safety related system component. It is the same type of problem that has been discussed so many times in connection with interference with the reactor control system and the reactor protection system. So there could be other areas which have not been looked at as carefully and it is possible that the system that you don't depend on and you don't need would fail in such a mode in the case of an accident that would interfere with one of the safety systems.

MR. KERR: I think what we need is a third category which is equipment important equipment important to safety. Those are the things that fall under 7.

MR. ZUDANS: It is like a next level subsystem.

MR. KERR: On page 5, this list of equipment important to safety prepared and maintained in a central file. Maybe I should wait until we get to the regulatory guide because it has even more, but it strikes me that this is going to be a fairly thick file. I guess that is what one has in mind.

For every piece of equipment one has a pedigree that has all of the data available from tests and under what conditions.

MR. ROSZTOCZY: Typically this file would include for a given equipment type a test report which has established the qualifications, one or more test reports, which established the qualifications, some additional documentation, an evaluation of analysis by the owner/operator of the plant and his review that this qualification was really established and that is about it.

MR. ZUDANS: Is this what we call a plant qualification file?

MR. ROSZTOCZY: We usually call it a central file for equipment qualifications. We are not insisting that this has to be maintained separately from the existing files. He usually has a filing system set up in such a way that these documents are already there filed in the system. They can maintain it right where it is. There is no need to set it aside in a separate file. The emphasis is there, but the owner of the plant has the responsibility to set up and maintain this file. He cannot depend on others like the manufacturer of the component to do this.

MR. KERR: What is this file going to be used for?

MR. ROSZTOCZY: It is going to be used to establish replacement times, for example, for the effective lifetime for the equipment and when does it need to be replaced and to be available to be looked at if there is a failure observed in the plant either under normal operations or in case of an accident to see why did it fail.

MR. KERR: I can't imagine that this qualification test could tell you why a piece of equipment failed.

MR. ROSZTOCZY: The qualification test can tell you whether there was a problem with the qualification and that resulted in the failure.

MR. KERR: If there is a problem in the qualification then your equipment is not going to be qualified. You are only going to have equipment in the plant that has been qualified.

MR. ROSZTOCZY: An additional purpose that we have government agencies assuring that the equipment has been qualified for the long term and not the immediate future.

MR. KERR: I can understand that you guys need to know that a particular circuit breaker made by some manufacturing company has been qualified. There will be hundreds of them made and presumably there will be a qualification test and you can find that out with one piece of paper.

What I am trying to find out is what the plant operator will do. and, of course, he won't use paper, he will have it on a computer somewhere where he can read it out, but what will he do with all this information about frequency and voltage and temperature and humidity and so on that was used in the test?

MR. ROSZTOCZY: The plant operator when he receives the information reviews it and passes his judgment whether it has been properly qualified. Once he has done that he puts it in the file and it is maintained in the file just in case if additional questions comes up during the lifetime of the plant just like any other design document associated with the plant.

MR. KERR: Okay, if you are convinced.

MR. LIPINSKI: In this central file, what about the subcomponents? We were talking about transistors earlier in terms of being an important ingredient in an instrumentation system. Do you anticipate that this central file will maintain the list of subcomponents and what they were qualified to begin with?

MR. ROSZTOCZY: It is not a requirement to maintain any qualification information on the subcomponents. However, for the type of equipment that the utility expects to repair himself it would be wise if they kept information on the components that they might expect to replace themselves.

MR. LIPINSKI: So it would be particularly important with respect to transitors as to what temperatures they had been qualified to individually, because if they have one that is a high temperature transistor that went through the initial qualification test and then a replacement ends up being a low temperature transistor that equipment may not survive under accident conditions.

MR. ROSZTOCZY: That is correct. That is why if the utility himself is planning to replace transistors then he should maintain that information. Otherwise, he doesn't have the means to replace it and he doesn't know what he can replace it with.

MR. LIPINSKI: But you don't have any mechanism for a requirement to establish that this is done properly?

MR. ROSZTOCZY: The only mechanism is what you have seen here in the rule and the guide which says that the replacement part must have been manufactured and tested to the same or higher conditions than the previous part. In order to meet that requirement one needs both, he needs the specification for the original part and he needs the specification for the new part. If he has those two he can do the repair.

MR. LIPINSKI: But that gets back to the central file. You said it is up to the owner of the plant to maintain this file with the information, not the original manufacturer of the equipment but the current plant operator who now uses this equipment is to maintain such a file. He would then have to have this detailed information from the original manufacturer to know what went into that particular equipment and its individual component qualifications.

MR. ROSZTOCZY: I have to emphasize it again. He needs that only if he himself is planning to provide such a repair. If he is not doing that repair, then it is not necessary.

MR. LIPINSKI: But I don't see those words in here saying that if he plans to do repairs that he needs a more extensive file.

MR. WENZINGER: We are not intending, Dr. Lipinski, in this rule to require that each individual licensee be prepared to replace each individual subcomponent. These are only the minimum requirements. If the licensee chooses himself that alternative, then he would have to have these specifications that Zoltan mentioned. If he did not have those specifications he would then, I think, unless he could get them from some place other than his central file, would have to go out and actually replace the entire qualified component.

MR. LIPINSKI: I agree with you. All I am saying if you have not specified that he does have those options to replace the entire piece of equipment or to do maintenance on it. If you are telling him he is to maintain a central file and he chooses to do maintenance he has got to have additional information in that file that allows him to do proper maintenance.

MR. WENZINGER: That is correct, absolutely.

MR. ROSZTOCZY: He can maintain it himself or he can rely on the manufacturer to the extent that he wishes.

If he has a reliable manufacturer and he relies on him, then as long as he gets the appropriate information from the manufacturer he can do it on that basis.

MR. ZUDANS: I think there is maybe enough control where you say replacement parts have to satisfy the original design standards. Whether or not the utility maintains those standards in its file or gets them from the previous supplier that is open. That is a good point.

MR. LIPINSKI: That is one of the key things that concerns me about this entire procedure. You can get equipment qualified and you put it into a plant and you are expecting it there for a 30 or 40 year life. That is the beginning of your troubles because once that plant is initially commissioned and placed in operation everything should function. But then as time proceeds the problems then begin to arise and you have got to ensure that the procedures that you are spelling out here guarantee that that plant is going to be maintained properly right up to the last day that it operates and maintenance is one of the key ingredients.

The initial qualification gets you there on day one. Maintenance gets you there until the birthday 40 years later.

MR. KERR: Yes, but if we have to depend on NRC telling an operator what to do in detail about maintenance we are in pretty serious trouble. Maybe we are in bad trouble.

MR. LIPINSKI: We are in trouble right now because the rules do call for this equipment to qualify and it is not. The operator has already had this information in advance and that is why this rule is here today.

MR. ROSZTOCZY: Dr. Lipinski, the present thinking is that if the owner of the plant makes such a maintenance, then at that time he would have to place in the file both documents, the one that he replaced and the one he replace it with. I am not sure if this is clearly spelled out in the guide at the present time. Let's assume that we see to it that that is clearly spelled out. Would that address your question in an acceptable manner?

MR. LIPINSKI: Yes, that would take care of the concern.

MR. KERR: Other comments?

(No response.)

MR. KERR: On page 6 other comments?

MR. ZUDANS: On page 6 I have an editorial comment at line No. 4 which says "the times that integrity must be maintained." I believe they mean the duration of time during which the integrity has to be maintained.

MR. ROSZTOCZY: Correct.

MR. ZUDANS: It is not the physical time, right?

MR. ROSZTOCZY: That is correct.

MR. ZUDANS: Maybe that should be revised.

MR. KERR: Other questions or comments on page 6?

MR. ZUDANS: Are we going to talk about aging, a special discussion on that?

MR. KERR: Do you want to start a discussion on aging?

MR. ZUDANS: Yes. I think that is probably the biggest issue. I don't know whether that is clear or not.

MR. KERR: Why don't you start clearing it up.

MR. ZUDANS: Well, I can muddy it up more than clear it up honestly. If you had to precondition by natural or artificial aging to its installed end-of-life condition, that is a very difficult question and I would like to know how you have decided to address it. This is a very strong requirement. How accurately can you tell the way the aging methodology as known today will take you?

MR. KERR: Well, in the first place, do you understand what that first sentence says because I don't. If you do I want you to tell me. That is just sheer ignorance. It probably says exactly what the people in the trade say, but what does it mean? What does preconditioned to its installed end-of-life condition mean?

MR. ZUDANS: It means that you would like to have equipment that has been in the plant for 40 years tested at that time for the guides and the environment. How do you get the equipment to that condition if another issue, and that is a very difficult question.

MR. SULLIVAN: We are using preconditioned to mean aged or artifically aged.

MR. KERR: So it would mean the same thing if I said equipment before one starts a qualification test would be in its end-of-life condition?

MR. SULLIVAN: It doesn't have to be 40 years. You do the best you can using that technology to make it look like it is say 20 years old.

MR. KERR: Once we get this rule into effect do we have to stop testing the equipment because we have this pedigree that tells us exactly how long it will last and under what conditions? What is the relationship between the aging rule and the testing that we do? I had some vague idea that we tested things periodically to see how they were behaving. I am doing this qualification testing to see how long well they behave until they reach the end of life.

MR. SULLIVAN: I will give a general statement first. The qualification is to take care of potential common mode failure under a LOCA condition. Periodic testing takes care of random failures occurring for whatever reason in other than say LOCA conditions. So you don't test for the qualification any more. Say you qualify for 20 years. You would assume that if the LOCA came within 20 years the system would not fail because of the LOCA.

However, you still must periodically test because a fuse can blow or something of this nature. So there is the distinction.

MR. KERR: So the periodic testing is for behavior under normal conditions. Of course, only a certain amount of this equipment has to meet normal conditions.

MR. SULLIVAN: Period testing is for random failures to catch the randomly occurring failures. The qualification is to include common mode failure under LOCA or other severe conditions.

MR. ZUDANS: I would like to try something out that I tried on Sal yesterday. The qualifications required to survive a harsh environment once in a lifetime; is that a correct statement?

MR. ROSZTOCZY: Yes.

MR. ZUDANS: Why is it then necessary to age it?

MR. ROSZTOCZY: It is required to survive the harsh conditions, the accident condition independent of when the accident occurs. If the accident occurs in the first year of plant operation it has to survive it. If the accident occurs in the 40th year of operation it has to survive it.

Now, if we would take the equipment as it was manufactured and test it, that might be representative of the first year. So it does survive it in the first year, but you wouldn't know if it would survive it the same accident condition in the 40th year. The preaging puts the conditions, the test conditions on the equipment that is expected to accumulate during the 40-year lifetime and then puts it into the LOCA environment.

MR. ZUDANS: I think you said exactly what I wanted you to say. You put yourself at least in my mind on a question mark. I am trying to clarify. I am not trying to contradict.

If we define the environment during normal operations or anticipated occurrences as a mild environment, and we stated that we do not have to qualify anything for the mild environment, then we in fact agreed that there is no aging in a mild environment.

MR. ROSZTOCZY: No, definitely not.

MR. AGGARWAL: That is not correct.

MR. ROSZTOCZY: We are saying for the mild environment that it ought to be designed to those conditions and convinued surveillance can detect if there is any deterioration or if it was not properly designed.

The only thing that is important there, because the condition doesn't change during the accident, the probability that the equipment would give out while the accident is going on is very small because it doesn't see anything else than what it has seen in the previous 15 years and because our surveillance is not only on that one piece but on all the other similar pieces in this plant and in all of the other plants have indicated that it is designed properly to perform during his design life.

MR. ZUDANS: I think that maybe we should be careful not to mix up aging with normal wear and tear that the component sees during the lifetime. If you have a bearing it will wear out and eventually will age. That is not the aging that we are talking about. That you detect by your periodic testing and you have a life expectancy for the component already identified by the manufacturer's instructions. He tells you how to inspect it, how frequently to lubricate it and how frequently to replace the bearings. That is normal wear and tear.

When I use the phrase "aging" I mean the aging due to thermal and humidity and such environments that are not exactly considered in the design. Therefore, I would view the aging would only pertain to a harsh environment, to the time that a particular component is in fact placed in the harsh environment.

Now, granted, the harsh environment could persis for a minute, for an hour, for ten hours or for ten days. If we take the latter case when it is ten days then you may have to have some aging for the ten days but not for ten years.

MR. ROSZTOCZY: No, the aging would be for 40 years.

MR. ZUDANS: If you go only once in a harsh environment.

MR. ROSZTOCZY: Let's say I go only once with the harsh environment but I postulated that this event in the 40th year of operation of the plant. Let's take a component and let's say this component is made of some material and the characteristics of the material are changed with temperature or changed with irradiation. So now in the 40th year it has material characteristics quite different than what it had in the first year. Then it has to be shown that even when this material has this new characteristics, age characteristics, it is still capable of withstanding the accident loads.

MR. ZUDANS: That is exactly what should be taken of by the normal design process for the given environment.

MR. ROSZTOCZY: It is and then it is confirmed by qualification tests.

MR. LIPINSKI: I think what is important, and let's take radiation environment, if we have a mild environment some materials will be irradiated according to the definition. If I want to test them under this accelerated aging program, now it is not 40 years, it is whatever I define as being the limited life and it may be only five years, depending upon the material ---

MR. ROSZTOCZY: I agree.

MR. LIPINSKI: So I must irradiate the material to, let's say, its five year end-of-life condition and then do its test. At that point if I say it is only qualified for five years I must replace it every five years if I have not qualified it for a longer period.

But let's take now an accident care. Some equipment may not see anything greater than a mild environment. Other equipment, depending on its location, will see much higher radiation levels during the accident and they will get a total integrated dose based on how long we say we need them for that accident. It is that radiation that they have to be qualified for, whatever accumulates in the accident and whatever accumulates after the accident.

MR. KERR: Zenon understands that. It is the aging he is concerned about.

MR. LIPINSKI: That is what I am talking about. The accelerated aging is precisely what we are talking about. The total dose that that equipment is to see when we say we no longer need it is what it has to have when we do the testing, and you do this by irradiating it over some sort interval of time, a day or two days.

MR. ZUDANS: What you are saying I understand fully. I have no argument with radiation as an aging agent.

MR. LIPINSKI: The same thing with temperature. There is a formula, the Serenious Curve, for accelerating the temperature.

MR. ZUDANS: There are other comments on the Serenious curve, but that is besides the point. I think, and I am not saying I am right, I am just trying to be right. I am trying to qualify in my own mind where should aging come in. What should it really mean? If I could satisfy myself that the equipment designers who are told that this equipment will operate in such and such environment will take care of the particular equipment being able to perform its function to the end of whatever life is set up by the manufacturer.

Now, if I now throw this particular piece of equipment in a once-in-a-lifetime harsh environment, then, depending on the length of that environment, I could be talking about aging within this environment. If it is only one hour or five minutes, I may not have to age it. If it is required for one year, then I could say I have to age it wtihin this environment because the original of the equipment did not take that into consideration.

If you say the equipment sits and is periodically inspected and periodically maintained and the components replaced, that takes care of the mild environment.

MR. SULLIVAN: During the prototype tests you would age say for 20 years. Then during the practical prototype tests you would keep the equipment in an autoclave or whatever for whatever the specified time would be, say 30 days or 60 days if one wanted to. The equipment would then be aging at an accelerated rate also just by the laws of physics in that environment. Then if subsequent to that the equipment was shown, that is the prototype was shown to operate, then it would have passed the test. This would occur I think naturally.

MR. ZUDANS: I am not getting across. I am saying the normal operation and anticipated operating occurrences represent the mild environment. It is not the same in every location in the plant. Nevertheless, you do not require qualification for that environment.

MR. SULLIVAN: You don't require qualification because ---

MR. ZUDANS: Now, let's stop at that. Now, if I sat for 40 years in that environment the equipment will survive that and there is no aging in it.

MR. SULLIVAN: In the mild environment.

MR. ZUDANS: That is not significant aging because whatever aging is there the design already foresaw it and components are replaced periodically.

MR. SULLIVAN: In the mild environment there may well be aging. The reason we don't require the testing is that at no time in the mild environment is the equipment subject to a sudden harsh environment. It is not subjected to the potential for common mode failure. In a steady state mild environment you are subjected only to a random failure much like the two hopefully independent light bulbs here. That is the distinction.

In a harsh environment you are subjected to the common mode potential. In a mild environment you are not. That is the distinction. There could well be a failure due to 38 years of aging in a mild environment, but that would be random. The chance of two devices failing at identically the same moment would be highly unlikely and I think that is the distinction.

MR. ROSZTOCZY: Let's take an example. Let's assume that I have a piece of equipment which I need following an accident and I need it for one full year after an accident.

MR. ZUDANS: That is a different story.

MR. ROSZTOCZY: Let's assume that this equipment is qualified for the 40-year lifetime of the plant so it has a 40-year lifetime. What do I have to do then to properly test it? Let's take just one parameter, let's say temperature. Let's assume that the properties of the critical element in the equipment, the properties change with thermal aging. Then I would have to do first is to somehow bring it to the condition in terms of thermal aging that might exist or that would exist at the end of 40 years. If the properties are such that it can take only half of the load at this condition then I have to bring it to that condition. This is normally done by an accelerated aging which is a preparation of the equipment for the test.

The second part is that it is going to thermally age during the accident. We do not calculate that and we do put that separately. That one is being put on simply putting it through the accident conditions.

So I first I thermally aged it to represent the 40 years. Now, I have the appropriate properties that you would have at the end of 40 years. With these properties I go into the LOCA test. I put it through the normal LOCA test which ages it further. So now the properties are such that it can't take one-half of the load. Now it can take only one-third of the original load.

Now I go into a post-accident aging to show that during the additional one-year after the accident, if I stll wantd to use it, that will further change the properties. If it survives all of this and I can still use it, meaning that whenever I open it or close it it can still work, then it is fine.

MR. ZUDANS: Your procedure works all right. I don't disagree with it and I understand it. But what I am trying to do is plant a thought in your head that indeed you should call the aging only this second part of the aging, namely, the one that is during the harsh environment. The other is aging in pricipal. What would that give to you? If you really figure a way to reconcile these issues then you could age without accelerating because you could conceivably keep it in a one-hour environment or two hours or three days or three weeks or even a year.

MR. KERR: Zenon, I don't think it is fair for the staff to be educating you in this area because then we would have to start charging you.

(Laughter.)

MR. ZUDANS: It is the other way around. I just wanted to be sure we understand and this aging issue is not simple.

MR. KERR: I understand the first sentence a lot better than I did. Tell me about the second sentence where it says "Aging considerations based on seismic and dynamic loads shall include a justifiable number of operating basis eqrthquakes." What is a justifiable number of operating basis earthquakes?

MR. ROSZTOCZY: At the present time I believe we are specifying five operating basis earthquakes as an accepted number?

MR. KERR: You are kidding me.

MR. AGGARWAL: Five OBE and one SFE. That is what the standards are calling for, too.

MR. KERR: I would say that is pretty safe.

Help my memory a little bit. Isn't there some sort of a rule that if you have an OBE you have to shut the plant down and test things?

MR. ROSZTOCZY: No, I believe it would be the other way around. As long as you have an event which is below an OBE, in other words, you can have two more very small events.

MR. KERR: But if you have an OBE you shut down and test, don't you?

MR. ROSZTOCZY: Above it for certain but below I don't believe so.

MR. KERR: Who knows? Anybody? I don't. I was going to look it up.

Savio, you know.

MR. SAVIO: Above the OBE it has to be inspected and the operation justified.

MR. KERR: What does inspected mean, that you walk about and look at it?

MR. BAGCHI: We can go to the experience we had at Humbolt Bay. It was just exactly that, walk around and look at it.

MR. KERR: So it doesn't have to be tested. I just wondered why if you were going to have to test it after the OBE you have to test it before, but you are telling me now that you have got it beforehand so you know that when you inspect it you won't see anything.

MR. LIPINSKI: With respect to that last discussion with respect to earthquake instrumentation, alarms come in to tell you you have exceeded the OBE, but you don't know how high you have gone. They have recording seismigraphs. They did not give you any information in the last discussion, and I forget who the licensee was, but it took a 24-hour turn-around to remove the film from the device, send it into town and have it developed and returned before you actually found out what the peak accelerations were. So the question is what do you do in the meantime.

MR. KERR: I would guess if you had an earthquake as severe as an OBE at almost any site there could be some concern about looking because an OBE is big enough that you will feel it.

MR. LIPINSKI: Well, the licensee said they would inspect the plant initially and unless there was a break they would not shut down.

MR. KERR: So aging requires five OBE's. What are other dynamic loading effects? To what does that refer?

MR. ROSZTOCZY: That refers to other dynamic loads that the equipment is exposed to during the normal operation. For example, if this is an equipment which is exposed to vibration during normal operation. Then whatever the vibration, it would be the quantity effect of vibration.

MR. AGGARWAL: Dr. Kerr, I would like to clarify on the issue of five OBE's.

MR. KERR: Yes, sir.

MR. AGGARWAL: Before me I have the Standard 344, the 1975 version, page 14. It is stated that "The number chosen shall be justified for each side or 5 OBE's shall be used."

MR. KERR: Well, if the IEEE said it then it must be pretty good.

(Laughter.)

MR. AGGARWAL: I just wanted to clarify that is actually the requirement.

MR. ZUDANS: At least that represents a consensus.

MR. KERR: Any other comments on page 6?

(No response.)

MR. KERR: On page 7?

(No response.)

MR. KERR: I guess I am fighting a losing battle on page 7, but I don't really think what is described here as "margin" is a margin, if I understand. It is simply a taking into account of uncertainties in production and measurement. To me that is not a margin unless it is a zero margin because if the uncertainty is there the margin could be anything down to and including zero.

It seems to me that what one says is that one takes account of in setting numbers of uncertainties in manufacturing and measurement. I have difficulty in calling this a margin, but that is a matter of taste. I don't object to it. I just think it is misleading.

MR. SULLIVAN: I understand your point, sir.

MR. ZUDANS: If the requirement is only to test a single component and show that it survives, you would have to test statistically to destruction the number of components in an excess environment to talk about margin. They say the production errors. They don't come from this test nor qualification. They come from some place else, the manufacturer.

MR. KERR: I don't think you mean the production errors come from this test. You mean that you want somebody to estimate that variability due to production, not necessarily errors, but just production variability, and include that within the whatever it is that one fairly uses as a result. Is that what you had in mind?

MR. ROSZTOCZY: It should include both, the one that Don mentioned and the one that Dr. Zudans mentioned.

One of them is simply that they are differences between one case and another case even if they are coming from the same production line. The other one is that the number of pieces that you test introduces a certain uncertainty. The most you test it the lower the uncertainty and both of those should be accounted for. The present wording doesn't clearly that. So maybe we ought to change the wording.

MR. AGGARWAL: That is indicated in the regulatory guide 1.89.

MR. ZUDANS: I think using the word "error" is in error. You really are not talking about errors. You are talking uncertainties or tolerances or something. If you had an error the equipment would not be correct.

MR. SULLIVAN: That is correct. We are talking about tolerances in terms of production error. But we are also talking about instrument error, too. That is valid.

MR. ZUDANS: Not error, accuracy. There is no error. If it is instrument error, then you just don't read it.

MR. SULLIVAN: Well---

(Laughter.)

MR. KERR: I am with you, by the way, but that is a losing battle I am afraid.

MR. ZUDANS: I think it is just an editorial question.

MR. KERR: Any other comments on margins?

(No response.)

MR. ZUDANS: What has this to do, in the second sentence, what has the qualification to do with the margins applied during the derivation of the plant parameters? I don't quite understand.

MR. SULLIVAN: Well, for example, let's say you calculate that the containment pressure is 40 pounds under an accident condition. Let's say if one does that and then one decides well, I have got to call it 42 pounds, that is the designer of the containment. He adds two pounds. Then the qualifier has to start with 42 and not with 40. He has to start with 42, the qualifier, and then add to that other mar,ins to take into account, we will call it the production error or the instrument inaccuracy or whatever. He may actually be reading his instruments at 4 pounds indicating 44 or 45 pounds.

In other words, if they derived the containment pressure as 40, the architect/engineer, but add two more for their own margin, you just can't test at 42 and say that is good enough. You have to assume it is going to go to 40 and you start from there.

MR. ZUDANS: So what you are saying is if I define the pressure envelope for test and if I compute it for that particular harsh environment on the basis of best estimate, say I had 42 psi ---

MR. KERR: But you don't use best estimate.

MR. ZUDANS: I throw in 50 psi because of the likely -- well my analytical methods are not at best so I maybe have some estimate that has some margin.

MR. KERR: You are requiring analytical models for LOCA to be used, aren't you, to calculate the containment pressure?

MR. SULLIVAN: Well, we are saying whatever it used ---

MR. KERR: This business of the reg. guides, as I remember you require the evaluation models for LOCA to be used.

MR. ROSZTOCZY: Yes, but those are only a realistic description to the extent that the licensee is able to describe the process. What we are basically saying is that when they establish the environmental parameters they have to account for the uncertainties of the method of how they established the environmental parameters. They do that as one stop. Separately in another step when they test their equipment, then they should cover the uncertainties associated with the testing of their equipment. These two together then provide an appropriate margin.

MR. KERR: Oh, I didn't realize that you give them a chance to diddle with the pressure that they calculated from the evaluation model. You do then? You permit them to say that is too conservative so I am going to take off some?

MR. ROSZTOCZY: It is completely permissible for them to a realistic calculation and account for the uncertainties of that calculation. So the final product is that they know the actual case would not exceed the one that they are postulating.

MR. ZUDANS: I have one more question with respect to margins. I could understand the margins. If you took a component and ran it through a test environment. Now what is specified in a test and what they actually, the test lab applied during the test is not necessarily identical. The test lab has an accurate record of what they did within the tolerances of the instrumentation they used. So that is the envelope.

Now, this envelope has some relation to actual harsh environment that you want the component to qualify for. There is this margin between the test envelope and the actual environment which you really don't know. But once you run the component through that test with this environment, the margins that you have with respect to the actual harsh environment in the test have nothing do with the component's ability to survive. Those are not the margins that pertain to the component. This is something else.

If the component survived the environment, then you have to reduce that environment when you want to state the qualified life for the component on the basis of this test. You could talk about component fabrication deviation, some tolerances that might affect the life and that would be a margin that you would apply to your test environment to derive the environment for which this component is qualified.

This margin has nothing to do with the other margins that you have introduced from your best known harsh environment to test environment. It seems like this margin adds up those two somehow.

MR. ROSZTOCZY: I think Dr. Kerr was correct when he indicated earlier that probably "uncertainty" is a better word than margin. But both of these uncertainties have to be covered. That is our position.

MR. ZUDANS: But when you come up and state that this component will survive 200 degrees for five hours, a simply statement like that, that means you asked for it to be tested to some higher temperature in principle, or it has been tested to some higher temperature. But because the component, this particular one, survived the say 210 degrees, the next of the same batch may not survive 210 degrees because of manufacturing tolerances, right?

MR. ROSZTOCZY: Normally what one would do, you could use the 500 degrees. You don't necessarily have to use anything higher than that. If you use a large number of components so that it statistically establishes that they are going to survive, that is an acceptable way. If you use only a single component, then one would want to see some margin because you don't know for sure that the second piece will be the same way.

MR. ZUDANS: I agree with you. That is good. But that margin has nothing to do with the margin that is built into the derivation of plant parameters.

MR. ROSZTOCZY: That is correct, and that is exactly the statement, that you cannot ignore the second one because ---

MR. ZUDANS: Well, why is this statement here at all? Isn't this confusing?

MR. ROSZTOCZY: People often come up and say we tested only one and we tested it only to the 500 degrees.

MR. ZUDANS: Correct.

MR. ROSZTOCZY: But you shouldn't worry because somebody else when he did his calculation probably added lots of concepts about what this means to that calculation. We quite often hear this argument. So we intend to spell it out clearly that each of these are for a given purpose and they should be appropriate to cover that purpose and one shouldn't use these as an argument to ignore one of them.

MR. ZUDANS: I guess I see your point if I interpret this rule as a rule qualifying to a harsh environment that exists in a particular plant and not evaluate the component with respect to its test environment.

MR. ROSZTOCZY: One part relates to the test and the other relates to the actual in the plant. We are saying that both have uncertainties. In the process we are establishing both have uncertainties. The environment should be accounted for when you work for that and the tests should be accounted for when you do the testing.

MR. KERR: I note that the recipe is not given here. It is just said that it has to be accounted for.

MR. ZUDANS: I heard industry react to this question. I happened to attend that meeting and it wasn't clear to me then how those margins were applied. The simply statement was made that NRC, did you apply the margins. They did say did you apply the margins. I think I understand now better what you mean by that.

MR. KERR: Other comments on margins?

(On response.)

MR. KERR: On the chemical effects, the second line, this is just a suggestion. Rather than using "be equivalent to a more severe than" one might say "be at least as severe as." But that is a matter of taste.

Page 8 or did you have some more on page 7.

MR. ZUDANS: I have one on 8, but I don't know, it is maybe not significant. I find it difficult to accept "appropriate" in Item (ii) means. It is too loose. It says "Loads resulting from anticipated operational occurrences or accidents shall be combined with the seismic loads in an appropriate manner." What does that mean?

MR. KERR: That is called benignly ambiguous.

(Laughter.)

MR. ROSZTOCZY: It is purposely written with those words. In some cases if the loads are independent then a different combination is appropriate than if they are different loads and there are various methods of how these combinations can be accomplished. We purposesly don't want to specific if you take the square of the square or various things. Some of those are applicable to some cases and not applicable to others.

MR. ZUDANS: Instead of "appropriate" you could use the term "in accordance with rules established elsewhere."

MR. ROSZTOCZY: That will be equally vague.

MR. KERR: It doesn't sound as vague.

MR. ROSZTOCZY: The problem, Dr. Zudans, is that we do not have those rules established in a sense that we could hand it over to you or somebody else.

MR. ZUDANS: I thought you had the rules. They are being fought about but you do have the rules.

MR. ROSZTOCZY: Yes, but you still have this question of whether one load is independent from another.

MR. ZUDANS: It is only with respect to two loads, right. That is beside the point. I think "appropriate" is loose but also what I suggested is loose.

MR. KERR: But it doesn't sound as loose. I like yours better. It is more statesmanlike.

(Laughter.)

MR. KERR: Under (i) does that mean all equipment? You just say equipment shall be subjected to.

MR. AGGARWAL: Equipment important to safety.

MR. SULLIVAN: In other words, equipment within the scope of the rule.

MR. KERR: Now, this is after it has been aged with five OBE's and now it is tested with one more plus one SSE?

MR. AGGARWAL: Dr. Kerr, that is not correct. In that rule we stated that a justifiable number. That could be for a specific plant one or two or as many as four. But under testing we require that they will take as a minimum one OBE and SSE.

MR. KERR: So you age it by using the justifiable number. Does somebody know what that means?

MR. AGGARWAL: Well, it could be any number from one to five.

MR. KERR: Okay, somewhere between one and five and then you will run it through one more?

MR. ROSZTOCZY: Yes. As we discussed earlier, if you have a seismic event which is below the OBE, and it would be just a little below it, then the operation goes on. For a given side the expectation is that during 40 years they could have three of these. If they can show that the expectation is not more than three, then they could do it with three.

MR. ZUDANS: But in the aging phase you did not subject it to SSE?

MR. ROSZTOCZY: That is correct.

MR. ZUDANS: So the SSE is the key issue at this point?

MR. KERR: It also requires that one test it with the forces resulting from one operating basis earthquake, I think. That is what it seems to say, and one safe shutdown earthquake. Why do you separate the two, the safe shutdown earthquake doesn't encompass ---

MR. ROSZTOCZY: There is a difference between preconditioning and actual testing.

MR. KERR: It is the single line. Let's make sure we are talking about the same thing.

MR. ROSZTOCZY: Yes, we are talking about the same thing. I am just saying in the actual process there is a difference between putting the preconditioning on the equipment or to do the testing. For example, if a given equipment has to function through the event, so the requirement is not only to function afterward but to function through the event, then certain tests are being performed on the equipment while it is being shaken on the shake table. During this one OBE test that test is being performed. During the preconditioning you don't have to perform any tests. You are just conditioning the equipment.

MR. KERR: In an operating basis earthquake the equipment has to operate during the quake and not just after?

MR. ROSZTOCZY: Certain equipment I assume has to operate during the quake.

MR. KERR: What does the rule say? Does it say the equipment has to be operating during the earthquake?

MR. ZUDANS: On OBE you don't have to shut down if you don't want to.

MR. KERR: I guess you are right.

MR. ZUDANS: Unless you define OBE such that you would shut down. Then you could go at a higher level.

MR. KERR: We have been sitting at this table for two hours and ten minutes without a break. I declare a ten-minute break.

(Whereupon, a brief recess was taken.)

MR. KERR: We are on page 9. Any comments on page 9?

Mr. Davis.

MR. DAVIS: Yes, I have one, Mr. Chairman. I was confused in reading through here regarding when an analysis is acceptable as a method of qualification. The first reference to that occurs here I believe on page 9.

MR. AGGARWAL: That is correct.

MR. DAVIS: Now, you said in your presentation, Mr. Aggarwhl, that item (ii) under 4 is now deleted.

MR. AGGARWAL: That is correct. No. (iii) will become (ii).

MR. DAVIS: Does that mean that the NRC will accept analysis alone if prototype equipment is available for testing?

MR. AGGARWAL: No, sir. What we were saying is that any equipment which is installed prior to May 23, 1980, the anaysis alone, subject to NRC approval, is acceptable. Now, when we were saying prototype equipment is not available, basically that equipment must have been installed prior to May 23, 1980.

MR. DAVIS: Okay.

MR. AGGARWAL: So what I am saying is that (ii) is contained in (iii). Therefore there was no need to have (ii) as a separate item.

MR. DAVIS: Are you saying if the equipment was installed prior to May 23rd, 1980, then testing has already been done for it?

MR. AGGARWAL: No. I am saying if the equipment was installed prior to May 23, 1980, that analysis alone, subject to NRC approval, is acceptable.

MR. DAVIS: Even if prototypes are available for testing?

MR. AGGARWAL: Well, testing must have been completed before or some analysis performed prior to that.

MR. SULLIVAN: I think the answer to your question is yes. It is possible, it is conceivable that a prototype could be available, a prototype motor could be available from a real old plant. It might be used as a spare part, for example. It might be the only spare part. In which case the NRC, and I don't want to judge what they would do, but they might well not require the testing. I think the answer is yes to your question.

MR. DAVIS: Now, on page 4 of the guide itself, item 2(a), the first sentence says, "The NRC will not accept analysis alone without supporting test data."

MR. SULLIVAN: I am trying to find that. I found it before and I am trying to find it again. It is wrong and it has to be fixed. What page are you on?

MR. DAVIS: Page 4 of the Reg. Guide 1.89. That seems to conflict with what we just talked about.

MR. HINTZE: You are absolutely right. It does seem to conflict.

(Laughter.)

MR. HINTZE: It depends on what the implementation is. The guide is written "forward fit." Forward fit analysis alone is not acceptable except if it is too big and then you have to have test data on some of the parts.

MR. KERR: NRC will not accept means will not accept.

MR. HINTZE: That is right. But when you get back to the implementation it talks about plants which are of a certain vintage and certain things are accepted. The guide itself is a forward fitting guide and therefore it is not in conflict with what has been said.

MR. ZUDANS: I think even item (a) itself on that page contradicts within itself.

MR. DAVIS: Yes, it is self-conflicting right on that same page. Leave the first sentence out and you will be all right.

MR. HINTZE: I don't doubt but what that can happen.

MR. DAVIS: Also on that same item since you have changed 4 (ii) then you probably should also omit item (c) there.

MR. AGGARWAL: That is correct. That will be eliminated.

MR. DAVIS: They will at least be consistent.

MR. SULLIVAN: That is our intent.

MR. KERR: Item (c) in the guide?

MR. AGGARWAL: That is right.

MR. HINTZE: Yes. We have done that on my master copy.

MR. DAVIS: Thank you.

MR. ZUDANS: I would like to clarify something quite quite basic.

MR. KERR: I want to find out what item (c) is.

MR. AGGARWAL: It is page 4, Dr. Kerr, and it will be paragraph 2(a).

MR. KERR: Okay. Please go ahead.

MR. ZUDANS: The rule applies to all operating nuclear power plants I thought. What is going to happen to now categorize safety related or safety important equipment that has not been seismically qualified? Will it have to be requalified?

MR. ROSZTOCZY: The rule applies uniformly to all power plants but it had in it this one provision, that one that Mr. Davis pointed out a minute ago which says that for old equipment, and there is a debate as to what constitutes old equipment, we would consider analysis to show that there is no need for retesting. So if a convincing story can be made through evaluation or analysis that retesting is not required then we would not go back and test it. If that cannot be made then testing would be required. For new equipment they would not have this choice.

MR. ZUDANS: I understand that. But if that is the case then analysis, if it is required for equipment installed prior to that date, it is not an insignificant effort. The initial statement that the rule has no impact, no economic impact, is not correct because everything the rule requires is already in existence. That is not true of the seismic qualification. It is true of the equipment.

MR. KERR: It is already true of safety grade equipment now. This rule makes a rather large extension of the amount of equipment that has to be qualified.

MR. ZUDANS: I think it talks about safety-related equipment.

MR. ROSZTOCZY: Let me try to answer both of them. In terms of what equipment needs to be qualified, there is no differentiation between this rule and the interim requirements set forth by the May 23, 1980, Commission memorandum and order. In terms of equipment they are the same. So we are enforcing the qualification today for the same equipment as it would be enforced under this rule.

In terms of the seismic there is a significant difference in that the Commission memorandum and order did not cover seismic events. That was back beyond. We are working now on the interim resolution for the seismic events and you are correct in pointing that out. Since the interim thing is not out yet right now, if this would become effective today, this would require additional work that has not been specified somewhere else.

MR. ZUDANS: So there would be a more significant impact, except if the interim requirements come out before the rule, then the statement would be correct.

MR. ROSZTOCZY: One would have to be careful there because the basic requirement in this case for the seismic events general design criteria two has always been there. So here the question will be that have they established in an appropriate manner compliance with GDC 2 in the licensing stage of the plant or in a prior stage of the plant. If they did not, then this could set them back, not as a new requirement but more just as an enforcement of the general requirement that has been there.

MR. KERR: We are playing with words. NRC does not establish practice. It establishes general principles. There is clearly here a significant change in practice on the part of the NRC. It may be desirable, it may be needed and it may be necessary, but it is a change.

MR. ROSZTOCZY: It would be a change for those plants which were licensed before the GDC was published, and I believe we do have some plants in that age group. So without any question there is a definite change.

For the ones which have already been licensed under the GDC it becomes a question of how was the qualification established. If we can agree that that has been established in an appropriate manner there would be no impact. If we cannot reach that agreement there would be an impact.

MR. KERR: More questions or comments on page 9?

(No response.)

MR. KERR: Page 10?

(No response.)

MR. KERR: No. 3 on page 10 refers to the possibility of separate profiles for each type of event, for example, MSLB accidents and for LOCAs. Earlier Zenon raised a question about whether you were talking about once-in-a-lifetime events when you were talking about MSLB LOCAs and I guess here one apparently is testing for two once-in-a-lifetime events in some sense for good or ill. So it isn't quite as simply as just one once-in-a-lifetime event that is being looked at.

MR. SULLIVAN: What we are doing is giving the applicant a choice. You can take a motor, let's say, and check and test it for LOCA prototype. You can take a second motor and test it for a main steamline if you wish if it only has to be qualified for main steamline. Or you could take one prototype and give it an envelope that covers both of them. It is just an option. But they are only once-in-a-lifetime events. In other words, once you have a LOCA, and I am hoping we don't, but you don't use the motor again presumably. You throw it away.

MR. ZUDANS: I have a generally comment which is really not addressed in any of these points here. What rationale do you go through mentally when you decide on the sequence of tests, the environment first and then vibration or vibration first and then environment?

MR. SULLIVAN: Well, initially it was done by best engineering judgment. To some extent it still is. But to that end we are conducting or sponsoring research at Sandia Laboratories looking into this question.

MR. ZUDANS: To see whether there is any effect?

MR. SULLIVAN: Right. We refer to them as synergistic tests or synergistic effects. We refer to them as the synergistic tests of synergistic effects. That is what we meant by the synergistic effect in the early part. That is one aspect of this.

For example, in aging ---

MR. ZUDANS: But that is not synergistic effect.

It is a synergistic effect only if you do simultaneous testing.

MR. SULLIVAN: In the real world it is simultaneous. Let's say under temperature and pressure radiation it is simultaneous. For convenience one might wish to test a sequence, irradiate it first and then do the environment.

MR. ZUDANS: This is not the same thing. I can walk through my thinking but I don't know the answer. So that is why I am just looking for the logic in your specification.

I might vibrate a piece of equipment to the SSE and the OBE with the prescribed spectrum or I might take two pieces of equipment and walk them through a LOCA environment and they might behalf differently. On the other hand, I could walk that piece of equipment through a LOCA first and then vibrate it with the idea in mind that if I had a LOCA there is a slight probability that I might have also the seismic event. Now, it is very difficult for me to assume that a LOCA will induce a seismic event. I could likely think about it the other way around. My reasoning then would be to do a seismic test first and follow it by a LOCA environment. Is that how you reason it out?

MR. SULLIVAN: That is what the standard called for, the seismic was done before the LOCA. That is correct, the seismic and the vibra.ion is done. The device, which is shaken on the shake table, is then put in the autoplate.

MR. ZUDANS: Are you sure?

MR. ROSZTOCZY: In the 1974 version, the standard addresses this and specifies preconditioning is first, the second, the seismic, and the third is the LOCA, and then any post conditioning after that.

What was the reasoning that the Standard Committee arrived at, I would not know, but I would reason in a similar manner.

MR. AGGARWAL: I might point out that this is covered by paragraph 6.32 of IEEE Standard 323, 1974.

MR. ZUDANS: I admire the precision.

MR. KERR: Any more comments on page 10?

Any comments on page 11? G was written by a housewife, if I can insult the female members of the audience, not all housewives are female, though, because it worries about dust. I don't understand this worry about dust because it seems to me that dust might even protect equipment. Yet, somebody has to go along with a dust cloth, and dust the equipment.

Why dust in a regulation, if I may ask?

MR. ROSZTOCZY: It is a standard item in other regulations, and we have been making some test to try to establish how important this might be. Recently, a set of tests has been performed at Sandia Laboratories as part of the NRC equipment qualification program, and one of the items studied was to test the same equipment more than once with different amounts of dirt or dust on the equipment, and see if you get back the same results.

They have found differences between whether a new piece of equipment is being tested in a clean condition, or if they are testing equipment which is in a dustry condition. It is related in that case to the breakdown between two conductors in case there is dust, especially if dust accumulates humidity during the test, which is a LOCA test.

MR. KERR: But this refers to maintenance and quality assurance. It says, "installed electric equipment important to safety shall be subjected to adequate programs of preventive maintenance and quality assurance." If you had stopped there, I would say fine, but why do you pick dust? I can think of millions of things that are equally important as dust. This is a rule, not a reg guide.

MR. ZUDANS: I think that it is a good point.

MR. ROSZTOCZY: In all other standards that we are familiar with, like the military standard, dust is normally the one which is lifted out, I assume because best experience.

MR. KERR: Why don't we change that custom. We can point to at least one that doesn't mention dust.

MR. ROSZTOCZY: We are kind of with you, and this is the reason that we have asked our research department that as part of the equipment qualification research program, they should look more carefully at what kind of a standard should be established in this area. They are going to look at it, and we will see what they come back with.

MR. KERR: I hope that topic has received the attention it deserves.

Then the record of qualification, I won't comment on my opinion of that record of qualification. I guess I have said enough about that. I must say, though, I am encouraged even more to go out and buy some computer stock, because when one thinks of all the many computers that this will probably spawn, especially storage facilities.

Any other comments?

(No response.)

MR. KERR: This brings us to the value impact statement.

MR. LIPINSKI: Page 11?

MR. KERR: Yes, sir.

MR. LIPINSKI: The point is made here about preventive maintenance, and then H is a record of the qualification. Yet, in going through all of these, we talked about B on that list, I don't find a paragraph in here with any emphasis on the maintenance.

Ordinary maintenance, if I have failure on the equipment, there is nothing in here that address ordinary maintenance.

MR. KERR: This is entitled Environmental and Seismic Qualification of Electric Equipment. How much should be said about maintenance under that heading?

MR. LIPINSKI: I have the paragraph on the adequate programs of preventive maintenance and quality assurance.

MR. KERR: I know it is there, but I don't even see why that one is there, except maybe it is for motherhood.

MR. LIPINSKI. My point is that the equipment is initially qualified, and it is installed. That is not the end of the story because if there are any failures in that equipment, particularly if it is hermetically sealed, those hermetic seals have to be broken, whether they would have to be replaced each time. It is a question of how that equipment is designed, it may take a new seal every time you want to reassemble the device.

MR. KERR: While I think it is an extremely important topic, but do you put it under the heading of something entitled Environment and Seismic Qualification of Electric Equipment?

MR. LIPINSKI: In order to maintain that it is guaranteed throughout the life of the plant, yes.

MR. KERR: The environmental qualification by itself doesn't guarantee that at all. It is only one part of an effort to guarantee it. Maintenance is another part. But if you choose to isolate environmental and seismic qualification, I don't quite see how you include maintenance in that.

MR. ZUDANS: I think I will start taking your side this time. I think that this should be out of here. It has nothing to do with it, because this is done before the equipment is installed.

MR. ROSZTOCZY: That is correct.

MR. ZUDANS: It has nothing to do with installation.

MR. KERR: I agree with you one hundred percent, I don't know anything more important than maintenance.

MR. ZUDANS: But not in this.

MR. LIPINSKI: All right, then it is a question of why the other paragraph is in there, then.

MR. KERR: I don't know that.

MR. SULLIVAN: The reason was to justify the validity of the qualification. In other words, we are saying that qualification to be valid assumes that the installed equipment continues to be in the same state as the prototype equipment that was tested.

MR. ZUDANS: You have aged it, and you have done everything.

MR. SULLIVAN: The prototype equipment is artificially aged. Installed inside the plant, it is different equipment, but it is the same model, and so forth that is aging normally.

The stuff that was qualified is aged and in a certain condition, and we are saying that the stuff in the plant -- That is predicated on the assumption that it is the same as what was qualified.

MR. ZUDANS: But this rule addresses nothing that is in the plant.

MR. SULLIVAN: It is a little extra gingerbread we added, I will grant you that. Your point is well taken.

MR. KERR: You convinced Lipinski and Sullivan with one argument, that is pretty powerful, you know.

MR. LIPINSKI: I agree that if this is to serve one purpose, namely the qualification, the maintenance is not here. Now I find paragraph G in here.

MR. KERR: We took it out.

MR. LIPINSKI: Then that is fine.

MR. SULLIVAN: Maybe we should put something in the discussion as the basis for qualification, or something.

MR. KERR: Legislative history.

Does that complete that now, and bring us to the value impact statement?

Any comments on page 1, which justifies the need for the proposed action? As I understand it, the need is that we have been doing it all the time, and this just makes it legal sort of.

I think I see some desire to comment on the part of a member of the audience, Mr. Gallagher, is it?

MR. GALLAGHER: Yes, Gallagher from Westinghouse. I would like to make a comment more in the framework of an activity that I have been doing with the IEEE in working up a document, IEEE P827, which is a method for determining requirement for instrumentations, controls, and electrical systems important to safety.

This work was done by members of both the IEEE and people from the NRC. I think I am confused, or wonder about the accuracy of some of the statements that have been made with respect to the impact of this document. The rule addresses equipment important to safety, which as far as I understand, looking at what has gone on in the past, is a significant increase over equipment that has heretofore fallen into the area of qualification.

Reference has been made to the DOR guidelines, which were for qualification of Class 1E electrical equipment, which is that equipment which is in the safety system. Then NUREG-0588 talks about safety related electrical equipment, which if I understand properly from a meeting I attended in February of the Subcommittee on Plant Features Important to Safety, it is basically about the same as safety grade.

If I could have the overhead. This was a slide that was shown at that meeting. The purpose of this meeting, which was a subcommittee under Mr. Ward, was to look into the definitions of safety grade, safety related, and important to safety.

As you can see from this diagram here, which was presented at that meeting, there is a slight difference between safety related and safety grade in the area of QA. The difference is very slight.

MR. KERR: This is QA as defined by Appendix B?

MR. GALLAGHER: Yes, sir. QA is made through application by the Quality Assurance Branch.

As you see, there is a slight difference. I think one of the problems was that when you go to Appendix it talks more of safety grade, and important to safety, and there has been some mix up there, but they were working on this.

The agreement was that when you brought this to importance to safety, you included everything in the circle, which by various estimate has been anywhere between 75 to 85 percent of the instrumentation, control and electrical equipment in the plant.

MR. KERR: It seems to me that you are not confused at all up to now.

MR. GALLAGHER: Some of the inferences were that we were already doing that. The point I want to make is that we have been doing it --

MR. KERR: Let me call on Mr. Rosztoczy who quoted an order from the Commission dated some time or other, which mandated this.

You gave a number, I believe, and you said that the Commission Memorandum and Order No. so-and-so --

MR. HINTZE: CIL_80-21.

MR. ROSZTOCZY: I believe that is correct, 80-21.

MR. GALLAGHER: If I understand that right, this was for the rulemaking on environmental qualification of safety grade equipment, which is in this category, not equipment important to safety. I think that that is what is needed here, and what we tried to do in the IEEE, and I think the members here present from the NRC who were involved in that, that there is a strong need for an accurate definition of important to safety, which also grades the level of importance to safety.

Obviously, some equipment is more important to safety than other equipment, and one would, therefore, expect that it would have to meet higher confidence levels to perform the function than stuff that is of less importance to safety for various reasons, either the functions are not as important, or there are alternative ways of achieving these functions.

MR. KERR: Have you read CLI-80-21 of May 23, 1980?

MR. GALLAGHER: No, sir, only within the framework of this, as stated in this document here. As it is stated in the document in the rulemaking.

MR. KERR: If I understood Mr. Rosztoczy correctly, that tells them to work on equipment important to safety. Did I misunderstand.

MR. ROSZTOCZY: When you read the document, the Commission Memorandum and Order, and the word used there most often is "safety related equipment."

MR. HINTZE: Safety grade.

MR. ROSZTOCZY: I am sorry, when you read the document, "safety related equipment" is what is used most often in the Commission Memorandum and Order.

MR. KERR: So it does not talk about important to safety as much.

MR. ROSZTOCZY: It does not use "important to safety.? It doesn't use it, I believe, at all. It does use, in some cases, definitions like "class 1E equipment," which I believe is mentioned also.

In further discussions within the staff to try to use the approprite definition for each part, we agreed to use the words "equipment important to safety." There is no attempt by the user of these words to change in any sense the actual equipment considered, which was in the order.

Based on this, if I understand this graph correctly, the whole circle would mean all the equipment that you have in the plant, and the pie shaped one, which is specified hre as safety related, the larger of the two pies, that would be the one that we are calling "equipment important to safety." The Commission calls it "safety related."

MR. KERR: Okay.

MR. GALLAGHER: I think, as I recall this, the difference between this and this was on the order of five percent, or something like that.

MR. ROSZTOCZY: That is correct, and that is also my understanding.

MR. KERR: Where do we go from here, Mr. Gallagher?

MR. GALLAGHER: What I see is needed is, maybe this effort that is going on should join with the other group that is trying to bring about a more clear definition of important to safety, and some way of establishing principles that can allow one to identify instrumentation, control, and electrical equipment important to safety in some graded way, so one can then judge.

MR. KERR: How long do you think this would take?

MR. GALLAGHER: So far, it has taken the IEEE, working on the idea of a class 2E, about ten years, but I would say that a lot of that 10 years maybe was before the emphasis on the behavior of non-1E equipment during accident situations.

So I think there is now a reason for industry, as well as the NRC, to look into this area. I am not challenging that. What I am asking for is something that gives reasonable guidance, so that we who are trying to make implementation are allowed to use equipment which we feel can properly do the job, and use experience in other industries to help guide us in this, without having to go through some rigorous and very expensive qualification, or analytical approach to prove or to document what is already reasonably well know, but doesn't fit the regulatory rules.

It is an easy question, but I don't think that this is a way to answer it. If you went back and asked the people to analyze all the equipment important to safety in their plant, based upon the rule, and item 7, you are placing a tremendous economic on them.

MR. KERR: Let me see if I understand the point you are making. I will refer to your pie shaped diagram. If we include that part called safety grade, or safety related, which we agree deserves some special attention compared maybe to the rest of the plant, and indeed I think we would agree that one would want to be able to operate in a harsh environment for some length of time necessary to perform its function.

Your point, as I understand it is that it is your view that most of the equipment in operating plants that would fall in that pie shaped region would now operate in those environments, but documentation doesn't exist which can provide convincing demonstration. Is that your point?

MR. GALLAGHER: No, sir. My point is that most of the equipment that is in the pie shaped area is already under the qualification program.

MR. KERR: What does one mean by "under the program"?

MR. GALLAGHER: It either has been qualified, or under the rule it has to be done by 1982, or something like that. So it is already covered.

MR. KERR: Mr. Rosztoczy tells me that in his view, if I misquote you, please correct me, that what is included within this rule is only about that cross-hatched region. So it is not really very much increased.

MR. ZUDANS: No.

MR. KERR: I thought that is what he said.

MR. ROSZTOCZY: I believe that is correct. We are saying that the larger of the two pie shapes, which is labeled "safety related on this chart."

MR. KERR: So that in your view, this rule will only increase the ' .unt :f equipment to which attention must be paid by a fairly small fraction compared to the Commission's order.

MR. ROSZTOCZY: There is no increase. The larger of the pie shapes is the one which is presently being considered, and under the rule it would stay the same.

MR. KERR: Does that correspond to your view, Mr. Gallagher, or does the Commission order extend that pie bigger than that?

MR. GALLAGHER: If I read the definition given on page 5, and look down here, it says, for instance, item 1, systems f.r reactivity control, which would not now be included in that. They are not a . rt of that.

MR. ROSZTOCZY: The reactor protection system, in terms of reactivity control, is definitely in the safety grade area.

MR. GALLAGHER: That is right, but I think part of the mix-up here is that when one looks at the way that the general design criteria have been interpreted to date, reactivity control falls under those items that are general design criteria, which are called the protection system. I think that is accurate.

However, other people interpret reactivity control to be the normal systems which operate the plant, to move the rods in and out, and change boron, and so forth. If I understand this rule is going and addressing all systems which control reactivity as opposed to just those which are now in the protection system.

MR. ROSZTOCZY: That understanding is incorrect. We are not suggesting that.

MR. KERR: I sure misunderstood the rule. When I read that, systems that control reactivity, I interpret that as a control system.

MR. ROSZTOCZY: No, that would be only to the extent that it is needed for the safe handling of the plant following an accident, and that is only the protection system for reactivity control.

MR. KERR: Then I think you need an X or G section of this rule, because somebody who did not write it, when he reads, "systems required for reactor and process system heat control," for example, it is pretty broad. "Syst m required for reactivity control," to me that is a control system. If it doesn't mean that, I sure misinterpreted it.

MR. GALLAGHER: Dr. Kerr, I would think that if this rule was only to make application in this area, then maybe a lot of the confusion could be easily cleared up by calling it safety related equipment.

MR. DAVIS: Tha would exclude item 7, also, then?

MR. GALLAGHER: That is right. A lot of those items would not be under that. If what was stated here is correct, then change the name of the document, and get rid of the words "systems important to safety."

MR. KERR: Help me and Mr. Gallagher. Does this apply to control systems or not?

MR. ROSZTOCZY: I think you will have to read it in context. You have to read the sentence in front of that, which says, "such systems required to mitigate the consequences of accidents, and those systems whose failure or malfunction could cause an accident, or could cause an accident in process to worsen."

MR. KERR: A control system surely could certainly cause an accident, and progress to worsen if it malfunctions. There is no question about that.

MR. SULLIVAN: That is why a lot of the safety systems are there to deal with that accident.

MR. ROSZTOCZY: I think that we ought to look at this much more carefully to see what the exact wording is, but the intent is to keep it at the pie shape.

MR. GALLAGHER: Thank you, Dr. Kerr.

MR. KERR: Thank you, sir.

Any other comments on page 2 of the impact statement?

(No response.)

MR. KERR: How about page 3?

At the top of page 3, I read at the beginning of the first full paragraph, "there should be litte impact on the staff vis-a-vis the level of effort at the time the rule is approved." What does that mean? Does that mean that on the day of approval, the staff won't do more any more, but on subsequent days, they will have to work like hell?

(Laughter.)

MR. HINTZE: I did not write that, but I think what was meant was that because of the Commission's Memorandum and Order, and because of the implementation of 0588, and recognizing that that is going to take some time, and recognizing that before the rule is finally effective, it is going to take some time, there will be no increase because of the rule over that which was already going on.

MR. KERR: Just judging from my experience today, unless the rule is significantly changed, it might some additional effort to interpret it.

In 1.3.3, I have expressed myself earlier, but it does seem to me that it is not quite enough to say that the rule would have considerable impact on the industry because of backfit. It doesn't tell anybody anything, does it? It doesn't tell me much.

I don't why you write these value impact assessments, but I assume that the original intent was to give somebody who is going considering the rule some idea of what it would cost to do it, and what the benefit would be. Unless these things have been tossed into limbo because nobody uses them, it seems to me that whoever reads this needs a little more than that.

MR. HINTZE: Dr. Kerr, we will expand on the impact.

MR. KERR: Okay.

MR. ZUDANS: The same paragraph, do I perceive a contradiction here, "if the final rule is published as now proposed, the rule would have considerable impact on industry because of backfit." Didn't we just conclude that there would not be impact because the environments are already there?

MR. AGGARWAL: That will be a question of timing as to when the rule becomes effective.

MR. ZUDANS: The current requirements are effective, so if the rule is approved now, it changes nothing.

MR. AGGARWAL: Correct.

MR. ZUDANS: It is not quite correct that it changes nothing. There are seismic things.

MR. AGGARWAL: That is right.

MR. ZUDANS: But this is definitely a contradiction.

MR. KERR: Any other comments?

(No response.)

MR. KERR: This brings us to Enclosure D. Are there any comments on pge 1 of Enclosure D?

(No response.)

MR. KERR: Page 2?

I am interested in the statement that it also does not place any additional burden in record keeping beyond what is presently maintained by the applicants. Unless I thoroughly misunderstand what I have been reading up to now, it may not impose any burden, but it sure will impose a lot of additional record keeping.

MR. ROSZTOCZY: This is again relative to what we are doing presently under the interim requirement. The indication is that the new rule would not require anything more than the present requirements under the Commission Order.

MR. KERR: The Commission Order has these --

MR. ROSZTOCZY: The same setting of the central files by December of 1980, so as of December, it was required.

MR. KERR: With all of this detail?

MR. ROSZTOCZY: Yes.

MR. SULLIVAN: Under 323.74 there is quite an extensive list of documentation that should have been kept under that standard as well.

MR. KERR: I am glad the IEEE is on board.

On the same page, "Licensee and staff experience with the regulation will be used to evaluate the regulation." What does that mean? It is apparently in response to somebody's requirement that there has to be a plan for evaluating the regulation after its issuance.

MR. SULLIVAN: I believe that it is part of the regulation that the regulation be reviewed periodically. I don't recall the detail.

MR. KERR: It sounds to me like somebody said, well, the staff will sit at coffee one day, and say, what has our experience been, and everybody will say, great. It will be the evaluation.

MR. AGGARWAL: Under the Act that this has been prepared, they put a burden on NRC staff that after the regulation is enacted, that the staff will make, from time to time, an evaluation.

MR. KERR: I recognize the requirement. I am just saying, as one who writes responses to this kind of thing, that it strikes me as being a standard sentence which says, "We don't know what we are going to do, but we will do something." That is what it sounds to me. If that is what it means, I guess it is okay. If it means more than that, tell me what it means.

MR. SULLIVAN: It means that we are complying with the regulatory flexibility act, that is what it means.

MR. KERR: I thought that that was what it meant.

(Laughter.)

MR. ZUDANS: Don't you mean, in this last item, and I will read the sentence the way I understand it, "Licensee and staff experience with the regulation will be used to evaluate the regulation in a second cycle of NRC period and systematic review process"? There is no other evaluation, except official review.

MR. ROSZTOCZY: That is correct.

MR. ZUDANS: So you have to cross out, "in addition, this subpart will be reviewed."

MR. KERR: Zenon, you are even better at writing responses to this sort of thing than we are.

MR. ZUDANS: No, because I am not spoiled, I am not exposed.

MR. KERR: This brings us to the proposed reg guide, page 1. Are there any comments?

(No response.)

MR. KERR: Page 2?

MR. ZUDANS: On page 2, it is probably correct, although it is strange. The standard dated February 28, 1974, which was approved on December 13, 1973. In other words, the standard came out in 1974, but it was approved in 1973.

MR. ROSZTOCZY: That is correct.

MR. KERR: Page 3?

I am also glad to note that on page 3, dust is still being minimized. That is okay in a reg guide, I think.

MR. SULLIVAN: It is also in the discussion, it gives the basis.

MR. KERR: Page 4?

What is meant by the statement at the bottom of page 4 that high pressure is not necessarily a limiting condition?

MR. ROSZTOCZY: In some cases, what is important, for example, is how much steam, and maybe how fast does it get inside equipment. The high condition is not necessarily the limiting one. In some cases, the time variation that you achieve is important.

MR. ZUDANS: That is stated in the sentence before that.

MR. KERR: Is this true just to pressure, because you have picked out pressure here. It would seem to me that the same thing might even be true of temperature, or a number of other things. I wonder why you single out pressure. I don't disagree with it, I just wonder why it was single out.

MR. ROSZTOCZY: I believe the main reason behind this, just the one I mentioned for example, if you set up your equipment in such a way that it has the same pressure everywhere inside the equipment and outside, and then you start to test, and you are doing this at the highest maximum of the equipment, you might not have a limiting condition.

MR. KERR: But conceivably the same thing might be true of temperature, humidity, or any of a number of things. So why pick out pressure?

MR. ROSZTOCZY: In case of temperature, by running it at higher temperature is usually a delimiting condition. But you are right, we ought to look at it carefully, and see if the same circumstance might not apply to other things.

MR. KERR: I don't see any reason why to single out pressure.

MR. ROSZTOCZY: I think this paragraph addresses only temperature and pressure, so these are the only two, I think, that we are talking about. But you are right that maybe it applies to the temperature also.

MR. ZUDANS: In a sentence before that, you say that you should account for spatial and time dependence of these variables, and that takes care of it. This could be just to qualify, saying, for example, one can frustrate situations where the peak pressure alone did not determine the failure mode, as an explanation of it, if that is what is meant here.

MR. HINTZE: Yes.

MR. ZUDANS: Under A, how did this work out finally, will NRC accept analysis alone, or not? There was some inconsistency.

MR. KERR: We struck, I believe, (C) prototype equipment is not available.

MR. ROSZTOCZY: That is correct.

MR. ZUDANS: So in principle, now, analysis is acceptable if the equipment is prior to such and such a date?

MR. ROSZTOCZY: Correct.

MR. SULLIVAN: Or it may be acceptable with NRC approval.

MR. ZUDANS: But this sets more specific additional conditions when it is accepted, additional to the ones that are in the rule?

MR. KERR: This paragraph 2A and the rule should be consistent.

MR. DAVIS: It is consistent if you eliminate the first sentence.

MR. SULLIVAN: We have already discussed that. There is an apparent inconsistency in the first sentence, and we will have to look at that. So assume that the first sentence is not there, and from that point on we should be consistent, we have been trying to all day.

MR. ZUDANS: The rule says that that technique is precluded because of difficult size, or by the state of the art, and if the equipment is installed prior to May 1980. The guide on page 4 says, testing of equipment when practical in view of the size. So that could be corresponding to what is in the rule.

MR. SULLIVAN: It does correspond.

MR. ZUDANS: A and B would correspond to I, and C would be crossed out.

MR. SULLIVAN: Yes.

MR. ZUDANS: There is no date of the rule in the guide, but there is one in the rule.

MR. SULLIVAN: The guide is forward fixed.

MR. ZUDANS: And the rule is not.

MR. ROSZTOCZY: The guide is telling the reader how he can comply with the rule in the future.

MR. ZUDANS: As of what date?

MR. SULLIVAN: As of the date the rule and guide are published.

MR. ZUDANS: But that is not binding. Industry does not have to arrive at the same conclusion.

MR. SULLIVAN: That is correct, the guide is optional.

MR. DAVIS: One further question, under A.1, that item specifies acceptable methods to calculate the conditions inside the containment. Does it mean that no other methods are acceptable?

MR. SULLIVAN: No, it is means that other methods may be acceptable. This is not the only acceptable one.

MR. DAVIS: I think that it should say that because right now it doesn't.

MR. KERR: This is inherent in reg guides that this represents an acceptable, but in theory the only acceptable.

MR. DAVIS: The way it says it now, I interpret to mean that there are no other acceptable methods. It says, methods acceptable to the NRC staff are listed below.

MR. KERR: This has to be read in the context of what reg guides are supposed to mean. I understand the point that you are making, but in the context of reg guides, I think this is okay.

On the boiling water reactors and temperature pressure conditions inside containment, No. 2, test profiles included in Appendix A are not an acceptable alternative in lieu of plant specific calculations. Give me a little background on that. I don't disagree with it, I just wonder what the point is.

Is it that one simply can't encompass what you think are important variables by using a sort of a standard set of parameters, hence you have to be plant specific, is that what is meant?

MR. HINTZE: The standard lists a whole bunch of margins that should be added, the pressure 10 percent, radiation 10 percent, voltage plus or minus 10 percent.

MR. SULLIVAN: He is talking about the profile.

MR. HINTZE: The profile, I am sorry.

MR. ROSZTOCZY: Let me try that.

There is a profile given, and I am not sure but does this refer to the profile? Appendix A has a profile in it, it is not a fully defined profile. I am not sure if all the coordinates are there. But the purpose of that profile was not that it represent a limit for all power reactors of a certain class.

It was, I think, more as an example. What we are saying is that that profile could not be used without some judgment exercised that it represents a limiting condition for a given plant.

There is a subcommittee which is working on trying to establish -- an American Nuclear Society subcommittee, I believe, is trying to establish the kind of limiting profile which would cover certain classes of plants. Should those become available as published profiles, and there is a chance to look at them, then there is a possibility that those could be used across-the-board for that class of plant.

MR. KERR: The sense I get from what you say, and it doesn't seem unreasonable, is that the people who wrote that profile did not mean for it to be an acceptable test profile. One could get the impression, just from reading this comment, that they had written it, but you guys looked at it and decided that it wasn't acceptable.

MR. SULLIVAN: That is correct. What we are doing with the guide, we are endorsing IEEE 323 with exceptions. So we have to take exception with anything in the standard that we don't like.

MR. KERR: Mr. Rosztoczy, if I understand correctly what he is saying, says that this was written as an example, and was not intended to be a profile that you used in testing.

MR. ROSZTOCZY: Correct, sir.

MR. KERR: This would give one the impression, it gave me the impression, that IEEE set up this profile, which they thought was okay, and you guys don't like it. It seems to me that you could change the language slightly to say, since IEEE simply gives an example, the actual test profile muse be plant specific, if that is really what is the case.

MR. HINTZE: We simply wanted to point out that we did not endorse this particular profile.

MR. KERR: Everybody seems to be in agreement. It just seems to me that the language could be a little clearer.

MR. HINTZE: Okay, we will fix it.

MR. KERR: Page 6, under effects of chemicals, what is meant by plants that used demineralized water as spray solution?

MR. ROSZTOCZY: We find that sometimes people don't consider the affect of sprays on the assumption that they are not using chemical spray, they are using only water as a spray. Even if you use only water as a spray, it can have an effect on equipment. It can penetrate some equipment, and produce rusting, and so on.

So the only reason to have it there is to consider the effect of sprays even if they are not chemical.

MR. KERR: The sense of what you have in mind would not be changed if we struck the word "solution"?

MR. ROSZTOCZY: That is correct.

MR. KERR: I understand.

Under the radiation condition inside and outside containment, there is a statement that "one must consider the normally expected radiation environment plus that associated with the most severe design basis accident during or following that which equipment must remain functional."

It seems to me that that statement is inconsistent with what follows, and now I will illustrate my ignorance of, or misunderstanding of NRC rules, I guess. But the most severe design basis accident that I know of, to which one designs in FSARs, does not include anything like the source terms described under Part 1, rather one gets those source terms from TID 14844, which is not part of the design basis accident, but is part of the siting rule.

It, therefore, seems to me -- I am not objecting to you using these sources, there may be some reason for it, but it seems to me that they are not sources associated with the most severe design basis accident at all, because the most serious design basis accident is a LOCA, or something like that, and one is required to design so that the fission product release is very minimal.

MR. ROSZTOCZY: I believe the point is well taken. I find that almost every time, when design basis accident is mentioned, it creates more confusion than how much it is resolved. We are meaning, basically, that we are requiring certain source terms for LOCA, and certain somewhat lower source terms for steamline break. The most limiting of the two ought to be considered.

MR. KERR: It seems to me that it would be clearer and more consistent if you did that.

Tell me what is meant by a LOCA where the break cannot be isolated, and a LOCA where the break can be isolated. I don't understand a break that cannot or a break that can. I thought that if you had a LOCA, you had a LOCA, and you analyzed it as if it were a LOCA.

MR. ROSZTOCZY: If you take, for example, the Three Mile Island case where the valve stuck open, and that produces the loss of the coolant. Provided there is some other break like there was, one can terminate it.

MR. KERR: I am willing to bet, if the staff had proposed the Three Mile Island II accident for a LOCA, it would have required that the relief valve stay open and, hence, by non-isolable. You now define a design basis accident in which you can close up the LOCA?

MR. ROSZTOCZY: There are certain cases, for example, a stuck open PORV, which can be isolated by a block valve.

MR. KERR: I am simply asking, in your design basis accident scenario, do you permit isolation of LOCAs, or is this a new regime?

MR. ROSZTOCZY: I will stick to my previous statement that I don't like the word "design basis," that is all.

MR. KERR: But LOCA includes other than the DBAs.

MR. ROSZTOCZY: Then we are talking about the complete spectrum of loss of coolant accident, and there are some that can be isolated. I gave you an example, but let me give you another example. There are a number of plants which have loop isolation valves, so if there is a break anywhere in one loop, you can isolate it simply by closing the loop.

MR. KERR: I am not talking about what can be done physically. I am talking about the NRC permits to be done in analysis of LOCAs. Do you permit one to take credit for closing off those loops?

MR. ROSZTOCZY: If the equipment, which would accomplish the closing, is qualified for the conditions, and if a single failure cannot disable it, then, yes.

MR. KERR: It seems to me that it is almost not a LOCA. It is a release which can be closed off.

MR. ROSZTOCZY: LOCA, again, has a different definition in the regulations, and I think we have to leave it with that definition.

MR. KERR: But there are in the rules LOCAs, isolable LOCAs and non-isolable LOCAs that one can find in the rules now?

MR. ROSZTOCZY: No, in the regulations. If you look only at the regulations, you will find a definition of the LOCA, and both of these events would fall under that definition. In one case, the break location can be isolated, and the other it cannot, but both fall under the definition.

MR. KERR: So we are breaking new ground in this rule by defining an isolable and non-isolable LOCA.

MR. ROSZTOCZY: I believe so, and I am not sure if it is needed, but we will take a look at it.

MR. ZUDANS: Let me have a crack at it because I did not pay much attention.

I think the LOCA reference here is not necessary because you define certain radiation environments of which the worst has to be used for a test. If the particular test is made, nobody can know whether it is the isolable LOCA or not, because you cannot predict what to expect. So these are just hypothetical environments defined.

Whatever it was that was in the back of the mind of the person who defined, it is immaterial. He has to use the worst case. So this isolable LOCA or non-isolable LOCA are just misleading.

MR. KERR: I sure hate to give up the chance to break new ground. You don't often have that opportunity.

MR. ZUDANS: Then you have to say, PLOCA, partial LOCA.

MR. KERR: True.

Any more questions on page 6?

Page 7? Under No. 2, where one specifies the fuel rod gap inventory, where do those numbers come from? ARe they from something else? I ask the question not to be critical, I was just curious as to where the 10, 10b and 30 come from?

MR. ROSZTOCZY: Those are the present requirements that we are enforcing. How did they originally get there, I believe that they are an upper-limit estimate for any calculations which have been performed for a steam line break accidents in any of the plants. Typically, they fall significantly before that, so that is an upper limit.

MR. KERR: It refers to the fuel rod gap inventory.

MR. ROSZTOCZY: Yes.

MR. KERR: Are these what one expects to find in a fuel rod gap in normal operation?

MR. ROSZTOCZY: I am sorry, isn't it 10 percent of the fuel rod inventory, what they have to account for.

MR. KERR: It says, 10 percent of the total rod activity inventory, which I would assume means --

MR. AKSTULEWICZ: My name is Frank Akstulewicz, and I am with the Accident Evaluation Branch.

MR. KERR: Do you have the document before you, or should I read it to you?

MR. AKSTULEWICZ: I have the document.

MR. KERR: I am on page 7, and I am about six lines up where it refers to the fuel rod gap inventory and the rods should be assumed to be 10 percent of the total rod activity, and 10 percent of noble gases, except for crypton 85. I just wonder where those numbers came from?

MR. AKSTULEWICZ: That is taken verbatim from Reg Guide 1.25.

MR. KERR: Where did they get it?

MR. AKSTULEWICZ: I do not know. That reg guide was issued several years, and I do not know the basis.

MR. KERR: If I can .ontificate, when I get answers like that from my graduate students, when they tell me that they have read some NRC regulation and did not raise any question about where the numbers came from, I tell them that they ought to know better.

There must be some basis for those numbers. Rich, do you know?

R. SHERRY: I can't say exactly where those numbers came from in Reg Guide 1.25, but values that we hae seen in our research programs that have used for typical gap inventories are on the order of 10 percent for high power BWR fuel rods, and much lower values for low power PWR, down to the order of .25.

MR. KERR: There is only about 10 percent of the noble gases in the gap? That surprises me, I would have thought that there was more.

MR. SHERRY: That is a pretty good upper limit.

MR. KERR: Your guess would be that these are round off numbers from data?

MR. SHERRY: Yes, measurements.

MR. KERR: Thank you.

Any other comments on page 7?

(No response.)

MR. KERR: On page 8, on NO. 3, for a limited number of accident monitoring instrument with instrument range, my guess is that instrumentation should be instruments, but you might have a look and see what you have in mind. Maybe it shouldn't be instruments, and maybe it does mean instrumentation.

I am not sure, talking about a limited number of instrumentation, it may be instrumentation systems. I am being pedadic looking at construction, but that is a matter of style.

What is meant by this instrumentation system, where does it start and where does it stop, that you are going to expose to these source terms?

There is a sensor out there somewhere, and there is communication and logic, and then there is an instrument on the control room board, which part of that is that instrumentation system?

MR. HINTZE: In the first place, the base source term is the source term that they start with.

MR. KERR: I know that, but what is exposed to that?

MR. HINTZE: It depends on what components or where the instrumentation is located as to what it is going to see, how much of this it is going to see.

MR. KERR: This does not say that, and maybe it doesn't need to.

MR. ZUDANS: Are you talking strictly about instruments that are required to follow the course of the accident.

MR. KERR: He is not talking just about instruments. He is talking about instrumentation systems. Which are you talking about?

MR. HINTZE: In the first place, a component must be qualified to withstand the environment that it sees. The guide essentially addresses that.

MR. KERR: If I am talking about a source term --

MR. HINTZE: This is the source term that you start out with, and then from here you scale down based on how much shielding is between that and the instrumentation system, or the component, you scale down to whatever it sees.

MR. KERR: Where is the source term relative to the stuff?

MR. HINTZE: Whether it is in the atmosphere, or in the water, or someplace else, is that what you mean?

MR. KERR: I can locate my instrumentation system, if I have got it in the plant, but where does one put the source term?

MR. ROSZTOCZY: One puts the source term into one of two places, and then uses the limiting one. In one case, you put it into the containment, if the break was in the containment, and you assume that it all went out together with the coolant that left the cooling system. In the second case, you maintain it in the recirculating fluid system. You assume that it stayed within the recirculating fluid system.

MR. KERR: Do you think from that Section 3, one can infer what you are telling me?

MR. ROSZTOCZY: I am r sure of which page you are on.

MR. KERR: I am on page 8, No. 3. What you say makes sense, but I would not have been able to infer that from this.

MR. HINTZE: I think you are right. We need to add some more word that says where that is contained.

MR. KERR: Or else you say, use some common sense, or something.

MR. HINTZE: That is absolutely right.

MR. KERR: Under No. 5, the initial distribution of activity within the containment should be based on a mechanistically rational assumption. That one really threw me because the mechanistically ration assumption would never get the stuff in there, the fractions that we are using, so I don't know where to start with my mechanistically rational assunptions.

It certainly wouldn't, for example, get me 100 percent of the source initially in the drywell at time zero. So I am at a loss.

MR. SULLIVAN: Maybe it ought to say, it ought to be based on the following assumptions.

MR. KERR: My guess is that what the write had in mind was, he wanted to throw the 100 percent in there somewhere, but if there were walls and fans, breezes, or whatever, once you have thrown it, then he wanted what happened to it to be mechanistic. But, I am not sure.

MR. SHERRY: Dr. Kerr, what the write meant when he wrote that was that in certain situations the assumption typically made for site suitability calculations is that the source term is distributed uniformly within the containment, should not be made for judging calculations to determine where the material will go for equipment qualification. You must take into account the fact that there are barriers.

MR. KERR: I have a suggestion that you can think about. Rather than telling what you shouldn't do, you might say what you want the people to do. Either say, throw it all in at time zero, and now take account of whatever it is you want him to take account of.

Are there any other comments on page 8?

MR. ZUDANS: Does item 3 get results correctly?

MR. KERR: They understand the point we were making, and I think they will look at it.

MR. ZUDANS: Let me see if I understand it correctly. This is where the instruments are defined in Reg Guide 1.97 as the ones needed to follow the course of the major accident, and not just something?

MR. KERR: I think so.

MR. ZUDANS: For that reason, you want to put a lot more source terms.

MR. HINTZE: That is correct.

MR. ZUDANS: I understand.

MR. KERR: Any other comments on page 8?

(No response.)

MR. KERR: Page 9?

Again we find the injunction to use a mechanistic model, and that the assumption of 50 percent instantaneous played out should not be made. I think, again, if you know what you people to assume, or the recipe, it is better to tell them that.

MR. SHERRY: This is specified in Appendix B, the procedures for making the specific calculations.

MR. KERR: Appendix B says that the assumption of 50 percent instantaneous played out should not be made?

MR. SHERRY: It provides guidance on what types of calculations should be done to account for played out.

MR. KERR: What I am saying is, why not tell people what you want them to do, even if Appendix B makes a mistake of telling them what not to do, rather than telling them what you don't want them to do.

MR. SHERRY: What I am saying is that in Appendix B we tell them what we want them to do. On page 9, we note that the instantaneous played out assumption should not be made. This is the assumption which is as specified in Reg Guides 1.3 and 1.4 for site suitability calculations.

MR. KERR: Page 10?

Under No. 9, it seems to me that one should be more specific than to talk about the gamma radiation levels. I think you either mean dose or dose rate, or both. But levels, I think, is not specific enough.

MR. SULLIVAN: Okay.

MR. KERR: In 10, you are doing what I said, do, because you now refer to both dose and dose rate. Is there some reason to think that paint and coatings, and coverings will be sensitive to dose rate? I would have thought not, but I am certainly no authority in that field. Is that just in there in case somebody discovers sometime in the future that they are sensitive to dose rate?

MR. AKSTULEWICZ: I was talking with our contractor at Sandia. It was his opinion that dose rate may have an effect on coatings. He suggested that both dose and dose rate be --

MR. KERR: You have to watch those guys. They are used to dealing with kiloton, and megaton weapons.

(General laughter.)

MR. AKSTULEWICZ: This is in relation to equipment qualification.

MR. KERR: He really thought that ?

MR. AKSTULEWICZ: Yes.

MR. KERR: I sure would be surprised, but then I have been surprised before.

MR. ZUDANS: In actual practice, it is almost impossible to control the dose rate, because you either have a source, and that is defined, and then you put this thing and it sits there for days. I have seen no test where there has been an attempt to control the dose rate and the paint.

MR. KERR: I am puzzled by the mechanism that is being responsive to dose rate. Usually you have something responsive to dose rates because you have a repair mechanism at work, and I don't see any repair mechanism in paint, but then that doesn't mean much, it may be there.

It seems to me that you could save somebody a lot of trouble if somebody could make sure that dose rate is or is not important. You have another consultant somewhere who knows something about paint and radiation fields probably.

No. 12, equipment that may be exposed to low level radiation doses below 10 to the fourth rad should not be considered to be exempt from radiation qualification. I don't why one put below 10 to the fourth rads.

What it says to me is that you want people to consider the exposure to radiation down to zero, and maybe you do, but I don't see why. There must surely be some cut-off point, and I would think that 10 to the fourth rads might be it, below you don't worry about it.

I can't imagine anything, other than people, that is very responsive to ten to the fourth rads, and even people can stand it if you give it over a period of time.

MR. AKSTULEWICZ: If I might take the question again. One of the comments we received from the public as part of the NUREG-0588 comment period was an interesting response from the AIF which mentioned several pieces of equipment that had failure modes 10 to the fourth, or failure rates that are below to the 10 to the fourth on radiation.

Another reason for mentioning the 10 to the fourth was that heretofore licensees would say, it would not receive radiation levels of 10 to the fourth, so we are not going to qualify it. They would just blanket it off, and say, we are not going to look at it.

MR. KERR: If you believe that 10 to the fourth is important, could you find out if 10 to the third is not, and then cut off there? Here you have a zero cut off.

MR. AKSTULEWICZ: I understand your concern. This was discussed at length in 0588, and we thought we sort of fixed in 0588 by saying that if they showed us operating experience that would indicate that the stuff was qualified, then we would accept that as proof.

MR. ZUDANS: You should not make reference to any level at all.

MR. KERR: Or at least to find a level below which you will accept some sort of demonstration by which --

MR. ZUDANS: But if you cross out "below 10 to the fourth rad," and read that sentence, it makes sense.

MR. KERR: Except now you don't know what low level radiation doses are.

MR. ZUDANS: It is defined.

MR. KERR: An alternative way would be to say, equipment subject to doses below, whatever figure you pick, can be demonstrated to be not qualified by analysis or experience, or something.

MR. ZUDANS: But you may not have a unique answer for that.

MR. KERR: I have will have a unique answer if I put a number in there.

MR. ZUDANS: Zero.

MR. KERR: No, I will put 10 to the fourth, and that is a unique answer. It may not be a good one, but it is unique.

MR. ZUDANS: I meant to say, if you want that number to be valid for that particular piece of equipment, it cannot be unique for different materials.

MR. KERR: Do you know of a material that is going to go bad at 10 to the fourth?

MR. ZUDANS: I have no idea. That rad means nothing to me.

MR. KERR: Maybe Teflon would, or it would come closer to most things I know of. Nobody uses Teflon around radiation anyway, not at least in his right mind.

MR. ZUDANS: The point is that you don't even have to mention this level here in this statement.

MR. KERR: You have accumulated wisdom.

Any more on 10?

(No response.)

MR. KERR: On page 11, there is a statement that equipment important to safety and which could be subjected to high energy pipe breaks as defined in the standard review plan. Is it the equipment that is defined in the standard review plan, or high energy pipe breaks, it was not clear to me.

MR. HINTZE: I am not sure either.

MR. KERR: You can consider it.

In that paragraph, also in paragraph 3, and also in A of paragraph 4, one has "equipment are." I think one would want to say "equipment is." It occurs three times there.

MR. GALLAGHER: Again E.2 is where you will find the major bulk of equipment where it would be important to know exactly what is meant by "equipment important to safety."

Our normal practices would be, if it were in an area like E.1, those would mainly be sensors, and we would normally use what was already qualified. But item 2 mentions the question of the need to qualify a large amount of equipment that would be in this area that we were talking about earlier, unless there is a better definition of the application of this regulatory guide.

If it is to be the same as the rule, the rule is to be as you said earlier, then there isn't a problem. But if that is not so --

MR. SULLT :: The rule, I think is fairly important here, I agre~.

MR. KF R: Page 12?

The last sentence in the first partial paragraph, "Furthermore, the maintenance surveillance program," and so on. I am not quite certain why in the maintenance surveillance program, one picks this specific thing out for emphasis. I think that it may be a good idea to include it in the maintenance surveillance program, and to try to make it uniform, and maybe you have done it somewhere else.

But here, one is picking out that the design qualified life is not suffering thermal and cyclic degradation. Maybe you can't do everything at the same time, but if you are going to require periodic of the maintenance surveillance program, data and records, there are a good many things that one might want to look for. The place to treat that would be, maybe, a general requirement, which includes this.

MR. HINTZE: This was specifically added here because of the mild environment, and the excusing of testing for that particular environment.

MR. ZUDANS: It is no place here, because you are talking about a piece now sitting in the plant, and you are now telling what you will do while it is in the plant, while the rule and the reg guide address qualifying outside the plant, prior to installation.

MR. SULLIVAN: I can understand the concern for both.

MR. ZUDANS: It is not that it is not necessary, but that is not the place.

MR. KERR: It is certainly not, it seems to me, part of a qualification program.

MR. ROSZTOCZY: I think we have to be very careful at this point. The main statement of this paragraph is that equipment which is placed in mild environment does not need to be tested. Instead, you can rely on the surveillance program.

MR. KERR: You say that, you see, in the sentence before that. But now you have become specific. You say, not only must it be a good maintenance program, but it must be ordered every 18 months to assure that the design life is not suffering thermal and cyclic degradation.

If you are going to audit the maintenance program every 18 months, it seems to me you maybe ought to look for a good many things. I really don't think that it ought to be part of this reg guide.

MR. ROSZTOCZY: I don't know about the 18 months, but I think this paragraph, the mentioning of the surveillance program, and called here Containment Surveillance because the individual plants might use different names for it. But mentioning the surveillance program in this paragraph is a necessity because we are saying that the testing is being --

MR. KERR: But you have already done that in the previous sentence.

MR. HINTZE: I think we could delete the last sentence, and we would still have it there.

MR. ZUDANS: Yes.

MR. KERR: In part D, what is meant by "Should be defined by temperature readings as close as practical to the component being qualified"?

MR. ROSZTOCZY: Normally when you test equipment in a test chamber, there could be temperature variations in the test chamber, especially if the equipment is small relative to the chamber. This, I believe, is just simply guidance that the temperature should be measured as close to the equipment as possible.

MR. KERR: Does that mean that you put the thermal couple on the equipment because that is as close as practical. What does it mean?

Why not say that you measure the temperature of the equipment?

MR. ROSZTOCZY: No. You are mentioning the environmental temperature here, so you definitely don't want to put it on right on the surface. You are not measuring surface temperature, but you want to measure it close to the equipment. The problem, again, is that at least in some of the old test, we are finding that there was one temperature measurement in one big chamber, and there was different equipment put in there, and you don't necessarily know.

MR. KERR: It seems to me that as close to the equipment as practical is right up against it, unless you say something else. If you don't say something else, I don't see that you are giving much guidance, unless what you are really saying is, watch out that you really measure the correct environment equipment.

Do you see the point I am making? I am not sure I know how to do it better.

MR. ZUDANS: : It would be better to restate it, because if you say, as close, it could be completely wrong, too. It depends on how the equipment is shaped, and how large the particular environment is, and there are variations in the test chamber.

What the objective of this point seems to be, it is logically that there should be good information on what the environment was.

MR. KERR: That is what he is saying, I think.

MR. ZUDANS: Saying, close to the equipment, is one way.

MR. KERR: Another way is, don't let slobs do the experimental work. Get people who know what they are doing.

MR. ROSZTOCZY: It would not sound good in the reg guide.

MR. KERR: Make it a footnote.

(General laughter.)

MR. KERR: Page 13. On page 13, E and G. E refers to performance characteristics of equipment, and G refers to functional status of the equipment. What is the difference between the performance characteristics and functional status?

I don't know either, so you might give some thought to that. It was not clear to me.

Under I, you suggest either cobalt 60 or cesium 137.

MR. HINTZE: Yes, we have some changes there. It should be, "Would be acceptable as gamma radiation sources."

MR. KERR: You know, I take it, that you are going to get much more penetration with the cobalt than with the cesium. Have you thought about this, and have decided that either one was okay. But they are going to be quite different, because the energy of the cobalt is much higher, and if you have fairly dense material, you will get a lot more penetration from the cobalt.

I have not thought about it in detail to say that this is or is not okay for what you are going to be testing, but the characteristics you will get, other than surface, will be quite different for those two radiation energies. There are some cases where you want to use cobalt because I think there will be cases in which you will want a deep penetration, but it may not be necessary.

Page 13? Page 14, under B, equipment in these categories should remain functional, and so forth. Is one hour more or less arbitrary, or is there some reason for picking it out?

MR. ROSZTOCZY: I think that it is more or less arbitration within the limitations that the general guidance in the standard is to take 10 percent of the time. We are talking about something being exposed for 10 days, and to use 11 days, it makes sense.

When you get down, and you are saying that the equipment is going to perform its function in five minutes, then to use 5.5 minutes is not a very meaningful margin. Since, typically, only a few pieces of equipment are being tested, and there could be differences between them, the general feeling was that there should be a cut off for this, and it should go below a certain value. One hour was picked.

MR. KERR: It probably make sense. I assumed that it might be that, but I was just curious.

MR. SULLIVAN: There is one other reason that I have heard put forth, and that is that the accident could develop slowly. Let's say the trip point is 20 pounds, it could take an hour or so to get up to the 19 pounds, or 20 pounds. There is that kind of argument also.

MR. KERR: Part A of number 6, I think the explanation of synogistic effect leaves something to be desired. Synogistic effects, for example, I don't think result from dose rates. As I understand synogistic effects, they are effects that, roughly speaking, are non-linear, where you have one effect, and another effect, and you put something together, and you get an effect that is even worse, and it is because of a combination of the two.

MR. SULLIVAN: This can occur with dose rate combined with temperature.

MR. KERR: But that is not what this says. It says, for example, effects resulting from dose rate.

MR. ROSZTOCZY: It is totally valid.

MR. SULLIVAN: Synogistic has to do with two things, I think is what you are saying.

MR. KERR: If I understand synogism.

MR. SULLIVAN: You are quite right.

MR. KERR: What is meant by the statement that the calculated operating temperature of the equipment is contrasted, for example, with operating equipment. Is there something specific calculated, or is the intent that one account for the operating temperature?

MR. SULLIVAN: Where are you reading, sir?

MR. KERR: B, just above the bottom of page 14, the second line above the bottom. "Calculated operating temperature of the equipment." What is the significance of "calculated"?

MR. DAVIS: Just leave it out, I think, would seem to be good.

MR. ROSZTOCZY: The predicted or expected would do just as well.

MR. KERR: What about the operating temperature?

MR. ROSZTOCZY: It goes through on variations. It is not necessarily constant.

MR. SULLIVAN: Are you saying that we should drop "calculated"?

MR. KERR: Unless you want calculated rather than actual. If you want the actual operating, it seems to me that you say the operating temperature.

MR. HINTZE: If you know that, but quite often you don't know the actual until you have actually --

MR. KERR: Granted, you have to get it in some way, but what you want is the operating temperature, I think.

MR. ROSZTOCZY: Right.

MR. HINTZE: We will take care of it.

MR. KERR: Are we through with 14?

On page 15, I don't understand Part E. Can you tell me what that means?

MR. SULLIVAN: What that says, say, you have something that is subject to a harsh environment, if you want it to have on-going qualification, it is simply not good enough to use periodic testing, because that would not tell you whether something had degraded sufficiently such that the harsh environment could cause everythin to fail.

In other words, you would have to do on-going qualification. Actually take the stuff out after five years, age it artificially five more, or whatever, and then put it in an autoclave. It is simply not good enough to look at it or survey it to determine that, yes, it is good enough for five more years.

MR. KERR: On going qualification means, qualifications beyond the service? I don't know what on-going qualification means.

MR. SULLIVAN: It comes down to the amount of aging you can apply. For example, let's say that you can only age a prototype for five years. You would age a component for five years, and test it, and determine that it is okay.

MR. KERR: Yes.

MR. SULLIVAN: Then you would take another component similar to it, for example, like cable, and age it to five years. This will be sacrificial cable, and you just age it for five years in a plant, and let it sit there for five more years. Now at the end of five years, it has five years of artificial aging, and five years of real aging. It is a kind of bootstrap.

Then you take a sample from that sacrificial cable, and put in the autoclave. If it passes, and it has 10 aging on it, it is acceptable for five more years. You keep doing this all the way out. Ten years later, you pull out a piece of cable that has 10 years of real aging on it, and you can add five more of artificial aging, and just keep bootstrapping your way up.

MR. KERR: I understand what you are saying, but I have never been able to read it out of Part E.

MR. SULLIVAN: On-going qualification is defined in the standard.

MR. KERR: Okay. You are sure that somebody who is familiar with this will understand Part E?

MR. SULLIVAN: The concept of on-going qualification is fairly well spelled out in 323, and we are simply saying that you cannot just keep looking, go in there every five years and look at som-thing, and test it, in that sense, with a volt meter, and measure the resistance. You have to go through the autoclave route.

MR. ZUDANS: On the same page, you say, that in-use methodology is acceptable. What kind of a level of confidence do you have on that methodology, how much knowledge do you have of the specific materials information, or how much knowledge does industry have with respect to the specific materials information that is needed?

The device could be made of a number of different materials, and each of these materials has specific activation. If you calculate for one material, it requires one environment. If you calculate for another material, it requires another environment.

Is it really possible to age the entire component as it would be in real life, or do you have to punish parts of it dramatically in order to achieve some results on the others? How good is the method, anyway?

MR. ROSZTOCZY: I think the answer is that it is artificial, and through its artificiality it produces higher stresses in many components than would be equivalent to the four year lifetime. We have seen a number of failures in qualification tests, and it is not completely clear, but it is possible, that it is due to the accelerated aging.

What can you do to improve on it? What you can do is to come closer to the real life, which means that you age it at lower temperature and for longer times, but there is a practical limit to how far one can go. This is one of the major problems of qualification.

MR. ZUDANS: We had that discussion before, whether you need to age or not at one type of environment. I raise the question because of this, because you really cannot have anything that is totally reliable. You either destroy the component by the aging process, or maybe you don't do enough.

If there was a way to perceive the real behavior better than break it out, and test in a real harsh environment for a given time, maybe that would be better. That is a philosophy, and not a question. I don't know any better than you do.

MR. KERR: Any other comments on page 15?

(No response.)

MR. KERR: On I, what is meant by "identifying potential age related degradation"? What is a potential age related degradation, or how would one identify one?

MR. SULLIVAN: A good example of that would be during a maintenance program, or during periodic surveillance, one might notice, for example, a cable was becoming cracked.

MR. KERR: But that is an age related degradation. It is not a potential one.

MR. ROSZTOCZY: I think that we should strike the word "potential."

MR. KERR: Okay.

Any more on page 15?

(No response.)

MR. KERR: Page 16. Under 9, here I suffer from not having the familiarity with IEEE regulations, but a certificate of conformance by itself is not acceptable. Is that perfectly understandable to people who are in IEEE regulations?

MR. SULLIVAN: I don't think that that is particularly unique to IEEE. I think what it says is, we are not just simply going to take somebody's certification on a piece of paper that it is all right. It is going to have to be backed by the details of qualification program that is laid out here.

MR. KERR: Okay, it doesn't seem unreasonable.

Are there any other comments on page 16?

Page 17, I am a little puzzled by the second sentence on the implementation, which tells me that all operating plants are plants which have not received an operating license should meet the provisions of this guide. I would have thought one would say, this is an acceptable method of satisfying, or something.

On No. 2, those two sentences, what is the significance, "This position does not exclude equipment using materials that have been identified." Does that mean, if it is well known that some equipment are especially susceptible, you and the applicant can pick those out, and they require special treatment. How does one interpret that?

It may be perfectly obvious, but it is not clear to me.

MR. ROSZTOCZY: We are not setting a requirement for the older plant to go back and establish life for each of them. Nevertheless, if they do have some materials which are susceptible to aging, then they have to look at it.

MR. KERR: Who identifies that kind of material, you, them?

MR. ROSZTOCZY: The licensee. They provided as part of the bulletin a list of materials that we knew, and were available to us. It was not an exclusive list. It was a sample list, and they look at it.

MR. KERR: Would it be worthwhile saying something about a tip of a list, or a sample list was provided.

MR. ROSZTOCZY: We would say something about that only if it would be attached to the guide. If it is not attached to the guide, then one probably would not. We could say some general words, plastic, rubber types of materials.

MR. KERR: It just seems to me that if guidance would be helpful, and you could give it, it is a good idea. Maybe you can't give general guidance, I don't know.

In the last sentence of that same paragraph, reference is made to pre-aging valve operators and motors. What does that mean?

MR. HINTZE: Those particular two standards, IEEE 382 and 334, require aging as a prerequisite to testing. Those are the only two IEEE standards that have included aging as a requirement. So while we are exclusing aging on everything else, if they use these two standards, then aging is not excluded.

MR. KERR: Is there a difference between aging and pre-aging?

MR. HINTZE: They are the same thing.

MR. ROSZTOCZY: The diffentiation is, pre-aging prior to testing. During the LOCA testing, you age also. Pre-aging prior to testing is required for this.

MR. KERR: So you are not requiring that valves that go into plants be aged, but rather those that are tested?

MR. SULLIVAN: All of this pre-aging is of the prototype only.

MR. ZUDANS: I have one question on that. Maybe you addressed the question, but I did not hear it. Here on line 4, on page 17, you say, "licensee should meet the provisions of this guide." It sounds more like a regulation.

MR. KERR: We agreed, I think, that maybe this would be reworded.

MR. ZUDANS: I guess if you do what this guide says, you will meet some other regulation, but not this guide.

MR. KERR: This slipped through because there are still some vestiges of standards and research, and research slipping into standards. They have got to get that sort it out.

MR. ZUDANS: I am sorry, then, I missed the point.

MR. KERR: I think.

MR. HINTZE: We will accept that.

MR. KERR: On number 3, there is a reference to replacement component being qualified to the existing standards. What existing standards is meant here, or are meant?

MR. WENZINGER: The ones that are recommended by the guide and imposed by the rule.

MR. KERR: In your view, is it clear what is meant by existing standards in the context of the guide. If it is, we will let it go. It was not clear to me.

MR. WENZINGER: It was clear to me, but it may not be clear to somebody else.

MR. KERR: Give it some thought.

Are there any other comments?

The value impact statement. Are there any comments on the value impact statement?

(No response.)

MR. KERR: I will say that we will not go through and review the rest of this page by page, but anybody has any comments on any part of the appendices, now is the time to make the comments.

Are there any additional comments by the staff at this point?

MR. HINTZE: No, sir.

MR. KERR: I shall assume, then, that I shall report the result of our deliberations to ACRS. My guess is, or at least what I would recommend is that we either send along some informal comments, or perhaps write the kind of letter we usually send to Mr. Dircks in which we make some general comments about the rule and the guide. It goes out for comments at this point.

MR. SULLIVAN: That is correct, sir. It will be published for comment in about December.

MR. KERR: If we do write something, it will probably contain some of the comments that I have made, and some of the comments that have been made here. I don't know how we will finally put them all together.

I don't think that there will be any surprises in what you get. I don't see any major criticisms, except I think there will be suggestions and clarification in some places.

I certainly would want to urge that whatever effort is available can be put on getting some better idea, at least than I have, of what this is going to cost people, and what you foresee as a risk reduction.

Any comments on that?

(No response.)

MR. KERR: What I would like to do, then, is to thank the staff for their participation this evening, and bid them good bye, unless they want to stay.

I do want the consultants to stick around for a few minutes. We will, of course, be in an open meeting, but we will not to record that part of it.

(Whereupon, at 6:20 p.m., the meeting adjourned.)

NUCLEAR REGULATORY COMMISSION

This is to certify that the attached proceedings before the

____

in the matter of: ACRS/Subcommittee on Electrical Systems

Date of Proceeding: July 22, 1981

Docket Number: ________________

Place of Proceeding: Washington, D. C.

were held as herein appears, and that this is the original transcript thereof for the file of the Commission.

Mary C. Simons

Official Reporter (Typed)

Mary C Simons

Official Reporter (Signature)

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Patricia A. Minson

Official Reporter (Typed)

Patricia A. Minson

Official Reporter (Signature)

NUCLEAR REGULATORY COMMISSION

10 CFR Part 50

DOMESTIC LICENSING OF PRODUCTION AND UTILIZATION FACILITIES

Environmental and Seismic Qualification of Electric Equipment Important to Safety for Nuclear Power Plants

AGENCY: U.S. Nuclear Regulatory Commission.

ACTION: Proposed Rule.

SUMMARY: The Nuclear Regulatory Commission is proposing to amend its regulations applicable to nuclear power plants to clarify and strengthen the criteria for environmental and seismic qualification of electric equipment important to safety. Specific qualification methods currently contained in national standards, regulatory guides, and certain NRC publications for equipment qualification have been given different interpretations and have not had the legal force of an agency regulation. The proposed rule would codify these qualification methods and otherwise clarify the Commission's requirements in this area.

DATES: Comment period expires (60 days after notice in Federal Register). Comments received after expiration date will be considered if it is practical to do so, but assurance of consideration cannot be given except as to comments received on or before this date.

ADDRESSEES: Written comments and suggestions may be mailed to the Secretary of the Commission, Attention: Docketing and Service Branch, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, or hand delivered to the Commission's Public Document Room at 1717 H Street NW., Washington, D.C., between the hours of 8:30 a.m. and 4:45 p.m. on normal work days.

FOR FURTHER INFORMATION CONTACT: Satish K. Aggarwal, Office of Nuclear Regulatory Research, Electrical Engineering Branch, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, Telephone 301-443-5946.

SUPPLEMENTARY INFORMATION: Nuclear power plant equipment important to safety must be capable of maintaining functional operability under all conditions postulated to occur during its installed life. This requirement is embodied in General Design Criteria 1, 2, 4, and 23 of Appendix A, "General Design Criteria for Nuclear Power Plants," to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities"; in Criterion III, "Design Control," and Criterion XI, "Test Control," of Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to 10 CFR Part 50; and in 10 CFR § 50.55a(h), which incorporates by reference IEEE 279-1971,* "Criteria for Protection Systems for Nuclear Power Generating Stations." This requirement is applicable to equipment located inside as well as outside containment.

The NRC has used a variety of methods to ensure that these general requirements are met for electric equipment important to safety. For the oldest plants, qualification was based on the fact that the electric components were of high industrial quality. For nuclear plants after 1971, qualification was judged on the basis of IEEE 323-1971. For

*Copies may be obtained from the Institute of Electrical and Electronics Engineers, Inc., 345 East 47th Street, New York, N.Y. 10017.

plants whose Safety Evaluation Reports were issued after July 1, 1974, the Commission has used Regulatory Guide 1.89, "Qualification of Class 1E Equipment for Light-Water-Cooled Nuclear Power Plants," which endorses IEEE 323-1974,* "IEEE Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations," subject to supplementary provisions.

Currently, the Commission has underway a program to reevaluate the qualification of electric equipment important to safety in all operating nuclear power plants. As a part of this program, more definitive criteria for environmental qualification of electric equipment have been developed by the NRC staff. A document entitled "Guidelines for Evaluating Environmental Qualification of Class 1E Electrical Equipment in Operating Reactors" (DOR Guidelines) was issued in November 1979. In addition, the NRC staff has issued NUREG-0588, "Interim Staff Position on Environmental Qualification of Safety-Related Electrical Equipment," which contains two sets of criteria: the first for plants originally reviewed in accordance with IEEE 323-1971 and the second for plants reviewed in accordance with IEEE 323-1974.

By its Memorandum and Order (CLI-80-21) dated May 23, 1980, the Commission directed the staff to proceed with a rulemaking on environmental qualification of safety-grade equipment and to address the question of backfit. The Commission also directed that the DOR Guidelines and NUREG-0588 form the requirements licensees and applicants must meet until the rulemaking has been completed.

This proposed rule is based on the requirements of the DOR Guidelines and NUREG-0588 and is intended to codify explicitly the Commission's requirements for the environmental and seismic qualification of electric equipment important to safety. Technical areas addressed include (a) testing as the principal maans of qualification, (b) analysis and operating experience in lieu of testing, (c) ongoing qualification, (d) accelerated aging, (e) synergistic effects, (f) test parameter envelopes, (g) source terms, (h) margins, (i) documentation, and (j) backfit requirements. Regulatory Guide 1.89 is being revised to describe methods acceptable to the NRC staff for meeting the provisions of the rule; a draft of the proposed revision is being published for public comment concurrently with the proposed rule.

Upon publication of a final rule, the DOR guidelines and NUREG-0588 will be withdrawn.

REGULATORY FLEXIBILITY STATEMENT

In accordance with the Regulatory Flexibility Act of 1980, 5 U.S.C. 605(b), the Commission hereby certifies that this rule, if promulgated, will not have a significant aconomic impact on a substantial number of small entities. This proposed rule affects the method of qualification of electric equipment by utilities. Utilities do not fall within the definition of a small business found in Section 3 of the Small Business Act, 15 U.S.C. 632. Additional testing required under this rule will generate business for small entities engaged in environmental testing.

Pursuant to the Atomic Energy Act of 1954, as amended, the Energy Reorganization Act of 1974, as amended, and section 553 of title 5 of the United States Code, notice is hereby given that adoption of the following amendment to 10 CFR Part 50 is contemplated.

A new § 50.49 is added to read as follows:

§ 50.49 Environmental and seismic qualification of electric equipment important to safety for nuclear power plants.

(a) Each holder of and applicant for a license to operate a nuclear power plant shall establish a program for qualifying all electric equipment important to safety as defined in paragraph (b) of this section.

(b) Electric equipment important to safety means those electrically operated, actuated, or energized components necessary for the proper operation of systems important to safety as defined in Appendix A to this part. Such systems include systems required to mitigate the consequences of an accident and those systems whose failure or malfunction could cause an accident or cause an accident in process to worsen. Included are (1) systems required for reactivity control, (2) systems required for reactor and process system heat control, (3) systems required for containment isolation, (4) systems required for maintaining containment integrity, (5) systems required for preventing significant release of radioactive material to the environment, (6) instrumentation essential for operator action in accomplishing (1) through (5), and (7) equipment that could fail in such a manner that the failure would prevent the proper operation of equipment important to safety, or mislead the operator.

(c) A list of all electric equipment important to safety shall be prepared and maintained in a central file. This list shall, as a minimum, include:

(1) The performance characteristics (such as accuracy and response time) and integrity requirements under conditions existing during normal and abnormal operation, during the containment test, and during design basis events and afterwards and the times that integrity must be maintained.

(2) The range of voltage, frequency, load and other electrical characteristics for which the performance specified in accordance with paragraph (c)(1) of this section can be ensured.

(3) The environmental conditions, including temperature, pressure, humidity, radiation, chemicals, submergence, vibration, and seismic forces and their predicted variations with time, at the location where the equipment must perform as specified in accordance with paragraphs (c)(1) and (2) of this section.

(d) The qualification program shall include the following:

(1) Known Synergistic Effects.

(2) Aging. Equipment qualified by test shall, where practicable, be preconditioned by natural or artificial (accelerated) aging to its "installed end-of-life condition." Aging considerations based on seismic and dynamic loads shall include a justifiable number of operating basis earthquakes and other dynamic (cyclic) loading effects. Electromechanical equipment shall be operated to simulate the expected mechanical wear and electrical degradation. This shall be the qualified life for the

equipment. Where preconditioning to a qualified life equal to the installed life is not possible, qualification to a shorter qualified life shall be performed. Such equipment shall be replaced at the end of its qualified life unless ongoing qualification of prototype equipment naturally aged in plant service shows, by artificial aging and type testing, that the item has additional qualified life.

(3) Margins. Quantified margins shall be applied to account for production errors and test instrument errors. These margins shall be in addition to margins applied during the derivation of the plant parameters.

(4) Temperature and Pressure. The time-dependent temperature and pressure at the location of the equipment shall be established for the most limiting of the applicable postulated accidents and shall be used as the basis for the environmental qualification of electric equipment important to safety.

(5) Humidity. Time-dependent variations of relative humidity during normal operation and design basis events shall be considered.

(6) Chemical Effects. The composition of chemicals used shall be equivalent to or more severe than that resulting from the most limiting mode of plant operation (e.g., containment spray, emergency core cooling, or recirculation). If the composition of the chemical spray can be affected by equipment malfunctions, the most severe chemical spray environment that results from a single failure in the spray system shall be assumed.

(7) Radiation. The radiation environment shall be based on the type of radiation and the dose and dose rate of the radiation environment expected during normal operation over the installed life of the equipment plus the radiation environment associated with the most severe design basis event during or following which the equipment is required to remain functional, including the radiation resulting from recirculating fluids for equipment located near the recirculating lines.

(8) Submergence (if subject to being submerged).

(9) Seismic and Vibratory Loads.

(i) Equipment shall be subjected to the forces resulting from one operating basis earthquake and one safe shutdown earthquake. Other vibratory loads occurring during both normal operation and accidents shall be included.

(ii) Loads resulting from anticipated operational occurrences or accidents shall be combined with the seismic loads in an appropriate manner.

(iii) The characteristics of the applicable input motion shall be specified by response spectra, time history, or other means if appropriate.

(e) Each item of electric equipment important to safety shall be qualified by one of the following methods:

(1) Testing an identical item of equipment.

(2) Testing a similar item of equipment with a supporting analysis to show that the equipment to be qualified is acceptable.

(3) Experience with identical or similar equipment under similar conditions with a supporting analysis to show that the equipment to be qualified is acceptable.

(4) Analysis alone, subject to the approval of the NRC staff in the following cases--

(i) Type testing is precluded by the physical size of the equipment or by the state-of-the-art;

~~(ii) Prototype equipment is not available;~~

(iii) The equipment was installed prior to May 23, 1980.

(f) If an item is to be qualified by test -

(1) The acceptance criteria shall be established prior to testing.

(2) The tests shall be designed and conducted to demonstrate that the equipment can perform its required function as specified in accordance with paragraph (c)(1) of this section for all conditions as specified in accordance with paragraphs (c)(2) and (3) of this section.

The test profile (e.g., pressure, temperature, radiation vs. time) shall include sufficient margin to account for differences among various production units of the tested equipment and for errors within the instrumentation monitoring and controlling the test. This margin shall be in addition to that applied in deriving the values of the accident parameters.

(3) The test profile shall be either (i) a single profile that envelops the environmental conditions resulting from any design basis event during any mode of plant operation (e.g., a profile that envelops the conditions produced by the postulated spectrum of main steamline break and loss-of-coolant accidents) or (ii) separate profiles for each type of event (e.g., separate profiles for the MSLB accidents and for LOCAs).

(4) The same piece of equipment shall be used throughout the complete test sequence under any given profile.

(5) For seismic and vibratory loads testing--

(i) Equipment shall be qualified using multifrequency and multiaxial input motions unless justification for using a single frequency input motion or a single axis input motion is provided.

(ii) The design of the test mounting shall simulate the actual service mounting and shall not cause any extraneous dynamic coupling to the equipment being tested.

(iii) It shall be demonstrated that the actual input motion equals or exceeds the anticipated required input motion. The duration of each test shall equal or exceed the strong motion portion of the design earthquake and other dynamic loads.

(g) Installed electric equipment important to safety shall be subjected to adequate programs of preventive maintenance and quality assurance, including routine maintenance to minimize dust accumulation that could degrade the ability of the equipment to function properly.

(h) A record of the qualification shall be maintained in a central file to permit verification that each item of electric equipment important to safety is qualified for its application and meets its specified performance requirements when subjected to the conditions present when it must perform its safety function up to the end of its qualified life.

Dated at ________________ this __________ day of _________, 1981.

For the Nuclear Regulatory Commission.

Samuel J. Chilk
Secretary of the Commission

Draft 1
June 17, 1981

Proposed Regulatory Guide 1.89 Rev. 1

ENVIRONMENTAL QUALIFICATION OF ELECTRIC EQUIPMENT IMPORTANT TO SAFETY FOR LIGHT-WATER-COOLED NUCLEAR POWER PLANTS

A. INTRODUCTION

Criterion III, "Design Control" and Criteria XI, "Test Cont l," of Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to 10 CFR Part 50, "Licensing of Production and Utilization Facilities," requires that design control measures provide for verifying the adequacy of a specific design feature by design reviews, by various calculational methods or by suitable qualification testing of a prototype unit under the most adverse conditions and that proof tests be conducted to demonstrate that structures, systems and components will perform satisfactorily in service.

General Design Criteria 1, 2, 4 and 23 of Appendix A to 10 CFR Part 50 and §50.49 "Environmental Qualification of Electric Equipment Important to Safety for Nuclear Power Plants," to 10 CFR Part 50, requires that each type of electric equipment be qualified for its application and specified performance requirements, and provides requirements for establishing qualification methods and environmental qualification parameters.

This regulatory guide describes a method acceptable to the NRC staff for complying with the Commission's regulations with regard to design verification of electric equipment for service in light-water-cooled nuclear power plants to assure that the equipment can perform functions that are important to safety.

B. DISCUSSION

IEEE Std 323-1974, "IEEE Standard for Qualifying Class IE Equipment for Nuclear Power Generating Stations,"[1/] dated February 28, 1974, was prepared by Subcommittee 2, Equipment Qualification, of the Nuclear Power Engineering Committee of the Institute of Electrical and Electronics Engineers, Inc. (IEEE), and subsequently was approved by the IEEE Standards Board on December 13, 1973. The standard describes basic procedures for qualifying Class 1E equipment and interfaces that are to be used in nuclear power plants and components or equipment of any interface whose failure could adversely affect any Class 1E equipment.

The requirements delineated include principles, procedures, and methods of qualification which, when satisfied, will confirm the adequacy of the equipment design for the performance of safety functions under normal, abnormal, design-basis-event, post-design-basis-event, and containment-test conditions.

Equipment should be qualified to meet its performance requirements under the environmental and operating conditions in which it will be required to function and for the length of time for which its function is required. The following are examples of considerations to be taken into account when determining the environment for which the equipment is to be qualified: (1) equipment outside containment would generally see a less severe environment than equipment inside containment; (2) equipment whose location is shielded from a radiation source would generally receive a smaller radiation dose than equipment of equal distance from the source but exposed to its direct radiation; (3) equipment required to

1/Copies may be obtained from the Institute of Electrical and Electronics Engineers, Inc., United Engineering Center, 345 East 47th Street, New York, New York 10017.

initiate protective action would generally be required for a shorter period of time than instrumentation required to follow the course of an accident. The specific environment for which individual equipment must be qualified will depend on the installed location, the conditions under which it is required to function, and the length of time it is required to operate.

A component to be qualified in a nuclear radiation environment should be exposed to a fluence that simulates the total dose, conservatively calculated, that the component should withstand prior to completion of its intended function. Dose rates, spectrum, and particle type should be simulated as closely as practicable unless it can be shown that damage is not significantly dependent on dose rates, or spectrum, or particle type.

Equipment qualification is predicated on the assumption that qualification testing adequately simulated the environment and service conditions throughout the installed life of the equipment. Where routine maintenance is essential to maintaining equipment in the conditions simulated by the qualification test (e.g., cleanness), it is important that an adequate program of preventive maintenance and quality assurance be established, including minimizing dust accumulation that could degrade the ability of the equipment to function properly.

C. REGULATORY POSITION

The procedures described by IEEE Std 323-1974, "IEEE Standard for Qualifying Class IE Equipment for Nuclear Power Generating Stations,"[1/] dated February 28, 1974, are acceptable for qualifying electric equipment for service in light-water-cooled nuclear power plants to assure that the equipment can perform functions that are important to safety subject to the following:

1. Reference is made in IEEE Std 323-1974, Sections 2, 6.3.2(5), and 6.3.5, to IEEE Std 344-1971, "Guide for Seismic Qualification of Class 1 Electric Equipment for Nuclear Power Generating Stations." The specific applicability or acceptability of IEEE Std 344 is covered in Regulatory Guide 1.100.

2. Section 5 of IEEE Std 323-1974 pertains to principles of qualifications including various methods. In conjunction with Section 5, the selection of a qualification method should be based on the following:

a. The NRC will not accept analysis alone without supporting test data. Experience has shown that qualification of equipment without test data may not be adequate to demonstrate functional operability during design basis event conditions. Analysis may be acceptable provided (a) testing of the equipment is impractical due to size limitations, (b) testing is precluded by the state-of-the-art, and (c) ~~prototype equipment is not available~~.

3. Section 6.2 of IEEE Std 323-1974 pertains to establishing performance and environmental requirements. In conjunction with 6.2(7) of Section 6.2, the following should be used:

a. Temperature and Pressure Conditions Inside Containment for Loss of Coolant Accident (LOCA).

(1) Methods acceptable to the NRC staff, for calculating and establishing the containment pressure and temperature envelopes to which equipment should be qualified are provided below. Methods for calculating mass and energy release rates are summarized in Appendix A. The calculations should account for the time dependence and spatial distribution of these variables. High pressure is not necessarily a limiting condition.

Pressurized Water Reactors (PWRs)

Dry Containment --Calculate LOCA containment environment using CONTEMPT-LT or equivalent industry codes. Additional guidance is provided in Standard Review Plan (SRP) Section 6.2.1.1.A, NUREG-75/087.

Ice Condenser Containment - Calculate LOCA containment environment using LOTIC or equivalent industry codes. Additional guidance is provided in SRP Section 6.2.1.1.B, NUREG-75/087.

Boiling Water Reactors (BWRs)

Mark I, II and III Containment - Calculate LOCA environment using methods of GESSAR Appendix 3B or equivalent industry codes. Additional guidance is provided in SRP Section 6.2.1.1.C, NUREG-75/087.

(2) The test profiles included in Appendix A to IEEE Std. 323-1974 should not be considered an acceptable alternative in lieu of using plant-specific containment temperature and pressure design profiles unless plant-specific analysis is provided to verify the applicability of those profiles.

b. Temperature and Pressure Conditions Inside Containment for Main Steam Line Break (MSLB).

Methods acceptable to the NRC staff for calculating the environmental parameters of a MSLB used for equipment qualification are provided below.

(1) Models that are acceptable for calculating containment parameters are listed in Position 3.a(1).

(2) The test profiles included in Appendix A to IEEE Std. 323-1974 should not be considered an acceptable alternative in lieu of using plant-specific

containment temperature and pressure design profiles unless plant-specific analysis is provided to verify the applicability of those profiles.

c. Effects of Chemicals

Guidelines for the chemical spray solution are provided in SRP Section 6.5.2 (NUREG-75/087), paragraph II, item (e). For plants which use demineralized water as spray solution, effect of spray should also be considered.

d. Radiation Conditions Inside and Outside Containment

The radiation environment for qualification of equipment should be based on the normally expected radiation environment over the equipment installed life, plus that associated with the most severe design basis accident (DBA) during or following that which equipment must remain functional. It should be assumed that the DBA related environmental conditions occur at the most critical point of degradation during the equipment installed life, which may be at the end of its installed life.

Methods acceptable to the NRC staff for establishing radiation limits for qualification for BWR and PWR type reactors are provided in the sample calculations in Appendix B and the following:

(1) The source term to be used in determining the radiation environment for equipment qualification associated with a design basis LOCA should consider the most limiting environment associated with the following:

(a) For a LOCA where the break cannot be isolated, 100% of the core activity inventory of noble gases and 50% of the core activity inventory of the halogens should be assumed to be instantaneously released from the fuel to the containment. Fifty-percent of the cesium activity and 1% of the remaining "solids" activity inventory in the core should be assumed to be instantaneously released from the fuel to the primary coolant and carried by the coolant to the containment sump.

(b) For a LOCA where the break can be isolated, 100% of the core activity inventory of the noble gases, 50% of the core activity inventory of the halogens, and 50% of the core activity inventory of the cesium and 1% of the remaining "solids" activity inventory should be assumed to be instantaneously released (after an initial time delay) and circulated in the primary coolant system. This accident is not expected to produce instantaneous fuel damage. A 30-minute delay may be assumed for fission product release from the fuel. Greater delay times should be justified on the basis of system performance design that minimizes fission product release. No noble gases should be assumed circulating in the primary system following system depressurization.

(2) For all other design basis accidents (e.g., non-LOCA high energy line breaks, rod ejection or rod drop accidents) the qualification source terms should be calculated factoring in the percent of fuel damage assumed in the plant specific analysis (provided in the FSAR). When only fuel clad perforation is postulated, the nuclide inventory of the fuel elements breached should be calculated at the end of core life, assuming continuous full-power operation. The fuel rod gap inventory in the rods should be assumed to be 10% of the total rod activity inventory of iodine and 10% of the total activity inventory of the noble gases (except for Kr-85 for which a release of 30% should be assumed). All the gaseous constituents in the gaps of the breached fuel rods should be assumed instantaneously released to the primary coolant. When fuel melting is postulated the activity inventory of the melted fuel elements should also be calculated at the end of core life assuming full power operation. For this case, 100% of the noble gases, 50% of the halogens, 50% of the cesium

inventory and 1% of the remaining "solids" activity inventory in these elements should be assumed to be instantaneously released to the primary coolant.

(3) For a limited number of accident monitoring instrumentation with instrument ranges that extend to the maximum values the selected paramaters can attain under worst-case conditions, specified in Regulatory Guide 1.97, "Instrumentation for Light-Water-Cooled Nuclear Power Plants to Assess Plant and Environs Conditions During and Following an Accident," the source term should assume an initial release which considers the fission product release groups associated with grossly melted fuel. An acceptable assumption of fractional release for each group are: noble gases, 100%; I, Br, 100%; Cs, Rb, 100%, Te, 100%; Sr, Ba. 11%; Ru, 8%; and La, 1.3% (individual nuclides are listed in Table VI 3-1 of WASH-1400). The effect of natural and mechanical containment fission product removal may be considered on a best estimate basis to determine the rate of redistribution of the various groups from the containment atmosphere to other locations.

(4) The calculation of the radiation environment associated with design basis accidents should take into account the time-dependent transport of released fission products within various regions of containment and auxiliary structures.

(5) The initial distribution of activity within the containment should be based on a mechanistically rational assumption. Hence, for compartmented containments, such as in some BWRs, 100% of the source should be assumed to be initially contained in the drywell. For ice condenser containments, it should be assumed that 100% of the source is initially contained in the lower portion

of the containment. The assumption of uniform distribution of activity throughout a compartmented containment at time zero may not be appropriate.

(6) Effects of ESF systems, such as containment sprays and containment ventilation and filtration systems, which act to remove airborne activity and redistribute activity within containment, should be calculated using the same assumptions used in the calculation of offsite dose. See SRP Section 15.6.5 (NUREG-75/087) and the related sections referenced in the Appendices to that section.

(7) Natural deposition (i.e., plate-out) of airborne activity should be determined using a mechanistic model and best estimates for the model parameters (See Ref. 3, Appendix B). The assumption of 50 percent instantaneous plate-out of the iodine released from the core should not be made. Removal of iodine from surfaces by steam condensate flow or washoff by the containment spray may be assumed if such effects can be justified and quantified by analysis or experiment.

(8) The calculated qualification dose should be the sum of the calculated doses of the potential radiation sources at the equipment location (i.e., beta and gamma), and may be established by one of the following:

(a) The total qualification dose should be equivalent to the total calculated dose (beta plus gamma) at the equipment location. A gamma source (only) may be used for qualification testing provided analysis or tests indicate that the doses and dose rate produce similar damage to that which would occur under accident conditions, i.e., a combination of beta and gamma, or

(b) The beta and gamma qualification dose may be determined separately and the testing may be performed using both a beta and gamma test source.

Plant specific analysis may be used to justify any reduction in dose or dose rate due to equipment location or shielding.

(9) Shielded components need be qualified only to the gamma radiation levels required, provided an analysis or test shows that the sensitive portions of the component or equipment are not exposed to significant beta radiation dose rates or that the effects of beta radiation heating and secondary radiation have no deleterious effects on component performance.

(10) Paints, coatings and coverings on electric equipment should be assumed to be exposed to both beta and gamma dose and dose rates in assessing their resistance to radiation. Plate-out activity should be assumed to remain on the equipment surface unless the effects of the removal mechanisms, such as spray wash-off or steam condensate flow, can be jusitifed and quantified by analysis or experiment.

(11) Equipment located outside containment exposed to recirculating fluid system should be qualified to withstand the radiation equivalent to that penetrating the containment, plus the exposure from the recirculating fluid.

(12) Equipment that may be exposed to low level radiation doses [below 10^4 rads] should not be considered to be exempt from radiation qualification, unless analysis supported by test data or operating experience is provided to verify that its dose and dose rates will not degrade the operability of the equipment below acceptable values.

(13) A given component may be considered to be qualified provided it can be shown that the component can be subjected, without failing, to the integrated beta and gamma doses, accounting for beta and gamma dose rates, which are equal to or higher than those levels resulting from an analysis that (1) is similar

in nature and scope to that included in Appendix B [Appendix B uses the source term given in Position C.3.d(1)], and (2) incorporates appropriate factors pertinent to the plant design (e.g., reactor types and power level, containment size).

e. Environmental Conditions for Outside Containment

(1) Equipment important to safety, which are located outside containment and which could be subjected to high energy pipe breaks, as defined in the Standard Review Plan, should be qualified to the conditions resulting from an accident for the duration required. The techniques to calculate the environmental conditions should employ a plant specific model based on good engineering judgment.

(2) Equipment important to safety, which are located in general plant areas outside containment where equipment is not subjected to a design basis accident environment, should be qualified to the normal and abnormal range of environmental conditions postulated to occur at the equipment location.

(3) Equipment important to safety not served by environmental support systems important to safety, or served by other systems important to safety that may be secured during plant operation or shutdown, should be qualified to the limiting environmental conditions that are postulated for that location, assuming a loss of the environmental support system.

4. Section 6.3 of IEEE Std. 323-1974 pertains to type test procedures. The following should be used in conjunction with Section 6.3:

a. Equipment located in a mild environment defined in Positions 3.e.(2) and (3) are not required to be qualified by test. The "Design/Purchase" specifications which contain a description of the functional requirements of its specific environmental location during normal and abnormal environmental conditions will generally be acceptable. A well supported maintenance/surveillance program, in conjunction with a good preventive maintenance program, should be provided to assure that equipment so qualified will function for its design life. Furthermore, the maintenance/surveillance program data and records should be reviewed periodically (not more than 18 months) to assure that the design qualified life is not suffering thermal and cyclic degradation resulting from the accumulated stresses of service conditions.

b. Where equipment is located in watertight enclosures, qualification by test should be used to demonstrate the adequacy of such protection. Where equipment could be submerged, it should be identified and demonstrated to be qualified by test to demonstrate seal integrity and functional operability for the duration required. Shortened test periods and analytical extrapolation should be justified.

c. Where equipment is located in an area where rapid pressure changes are expected, qualification by test should demonstrate that, under the most adverse time dependent relative humidity conditions (superheated steam followed by saturated steam may be a limiting condition) and adverse postulated pressure transient for the equipment location, the equipment seals and vapor barriers will prevent moisture from penetrating into the equipment to the degree necessary to maintain equipment integrity for the length of time the equipment function is required.

d. The temperature to which equipment is qualified, when exposed to the simulated environment, should be defined by temperature readings as close as practical to the component being qualified.

e. Performance characteristics of equipment should be verified before, after, and periodically during testing throughout its range of required operability.

f. Chemical spray or demineralized water spray should be incorporated during simulated event testing at or near the maximum pressure and temperature conditions that would occur when the spray systems actuate.

g. Variables indicating functional status of equipment should be monitored continuously to assure that spurious failures (if any) have been accounted for during testing. For long-term testing, however, continuous monitoring during periodic intervals may be used if justified.**

h. Expected extremes in power supply voltage range and frequency should be applied appropriately during simulated event environmental testing.

i. Cobalt-60 or Cessium-137 is an acceptable gamma radiation source for environmental qualification.

5. Section 6.3.1.5 of IEEE Std. 323-1974 pertains to margin. In lieu of other proposed margins that may be found acceptable, the suggested values indicated in Section 6.3.1.5, should be used as a guide with the following exceptions:

a. Quantified margins should be applied to the design parameters discussed in Position C.3 to assure that the postulated accident conditions have been enveloped during testing. These margins should be applied in addition to any conservatism applied during the derivation of the specified plant parameters unless those conservatisms can be quantified and shown to contain sufficient margin. The margins should (a) account for uncertainties associated with the use of analytical techniques in deriving environmental parameters, when best estimates methods are used rather than conservative licensing methods, (b) account for uncertainties associated with defining satisfactory performance (e.g., when only a few units are tested (c) account for variations in the commercial production of the equipment, and (d) account for the inaccuracies in the test equipment to assure that the calculated parameters have been adequately enveloped.

b. Some equipment may be required by the design to only perform its safety function within a short time period into the event (i.e., less than 10 hours), and, once its function is complete, subsequent failures are shown not to be detrimental to plant safety. Other equipment may not be required to perform a safety function but must not fail within a short time period into the event, and subsequent failures are also shown not to be detrimental to plant safety. Equipment in these categories should remain functional in the accident environment for a period of at least 1 hour in excess of the time assumed in the accident analysis. For all other equipment (e.g., post-accident monitoring, recombiners, etc.), the 10 percent time margin identified in Section 6.3.1.5 of IEEE Std. 323-1974 should be used.

6. Section 6.3.3 of IEEE Std. 323-1974 pertains to aging. In conjunction with Section 6.3.3, the following should apply:

a. Where synergistic effects have been identified, (e.g., effects resulting from dose rates, and from different sequences of applying qualification test parameters) they should be accounted for in the qualification program.

b. The calculated operating temperature of the equipment under service conditions should be accounted for in thermal aging. The Arrhenius methodology is considered an acceptabe method of addressing accelerated thermal aging. Other aging methods that can be supported by tests will be evaluated on a case-by-case basis.

c. Known material phase changes and reactions should be identified to insure that no adverse changes occur within the extrapolation limits.

d. The aging acceleration rate and/or activation energies used during qualification testing and the basis upon which the rate and/or activation energy was established should be defined, justified and documented.

e. Periodic surveillance testing under normal service conditions is not considered an acceptable method for on-going qualification, unless the testing includes provisions for subjecting the equipment to the limiting service environment conditions (specified in § 50.49(c) of 10 CFR Part 50).

f. Humidity effects should be included in accelerated aging unless it can be shown that the effects of relative humidity are negligible.

g. The qualified life of the equipment (and/or component as applicable) and the basis for its selection should be defined and documented.

h. Qualified life should be established on the basis of the severity of the testing performed, the conservatisms employed in the extrapolation of data, the operating history, and in other methods that may be reasonably assumed. All assumptions should be documented.

(i) An ongoing program to review surveillance and maintenance records to identify potential age-related degradations should be established.

(j) A component maintenance and replacement schedule, which include consideration of aging characteristics of the installed components, should be established.

7. Sections 6.4 and 6.5 of IEEE Std. 323-1974 discuss qualification by operating experience and by analysis respectively. The adequacy of these methods should be evaluated on the basis of the quality and detail of the information available in support of the assumptions made. Operating experience and analysis based on test data may be used where testing is precluded by physical size of the equipment or state of the art of testing. When the analysis method is employed because of the physical size of the equipment, tests on vital components of the equipment should be provided.

8. Components which are part of equipment qualified as an assembly (e.g., a motor starter which is part of a motor control center qualified as a whole) may be replaced with components of the same design. If components of the same design are not used for replacement, the replacement component should be designed to meet the performance requirements and be qualified to meet the service conditions specified for the original components.

9. Section 8 of IEEE Std. 323-1974 pertains to documentation. In conjunction with Section 8, the documentation should include sufficient information to address the required information identified in Appendix C. A certificate of conformance by itself is not acceptable unless it is accompanied by information on the qualification program, including test data or comparable test data from equivalent equipment. A record of the qualification shall be maintained in a central file to permit verification that each item of electric equipment important to safety is qualified for its application and meets its specified performance requirements when subjected to the conditions present when it must perform its safety function up to the end of its qualified life.

D. IMPLEMENTATION

The purpose of this section is to provide information to applicants and licensees regarding the NRC staff's plans for using this regulatory guide.

All operating plants and plants which have not received an operating license should meet the provisions of this guide subject to the following:

(1) For plants which are not committed to either IEEE Std 323-1971 or the November 1974 issue of Regulatory Guide 1.89 (IEEE Std 323-1974) and have been tested for only high temperature, pressure and steam, equipment may not need to be tested again to include other service conditions such as radiation and chemical sprays. The qualification of equipment for these service conditions may be demonstrated by analysis.

(2) Regarding aging considerations in equipment qualification, for all plants which are not committed to the November 1974 issue of Regulatory Guide 1.89 (IEEE Std 323-1974), a specific qualified life need not be demonstrated. This position does not, however, exclude equipment using materials that have been identified as being susceptible to significant degradation due to aging. Component maintenance or replacement schedules should include considerations of the specific aging characteristics of the component materials. Ongoing programs should exist at the plant to review surveillance and maintenance records to assure that equipment which is exhibiting age-related degradation will be identified and replaces as necessary. However, plants which are committed to Regulatory Guide 1.73 (IEEE Std 382-1972) and Regulatory Guide 1.40 (IEEE Std 334-1971) should preage the valve operators and the motors.

(3) Beginning with May 23, 1980, replacement components or spare parts used to replace presently installed equipment or components should be qualified

to the existing standards unless there are sound reasons to the contrary. Non-availability and/or the fact that the component to be used as a replacement is in stock or was purchased prior to May 23, 1980 are among the factors to be considered in weighing whether there are sound reasons to the contrary.

APPENDIX A

METHODS FOR CALCULATING MASS AND ENERGY RELEASE

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METHODS FOR CALCULATING MASS AND ENERGY RELEASE

Acceptable methods for calculating the mass and energy release to determine the loss-of-coolant accident (LOCA) environment for PWR and BWR plants are described in the following:

(1) Topical Report WCAP-8312A for Westinghouse plants.

(2) Section 6.2.1 of CESSAR System 80 PSAR for Combustion Engineering plants.

(3) Appendix 6A of B-SAR-205 for Babcock & Wilcox plants.

(4) a. NEDO-10320 and Supplements 1 & 2 for General Electric plants.

b. NEDO-20533 dated June 1974 and Supplement 1 dated August 1975 (GE Mark III).

Acceptable methods for calculating the mass and energy release to determine the main steam line break (MSLB) environment are described in the following:

(1) Appendix 6B of CESSAR System 80 PSAR for Combustion Engineering plants.

(2) Section 15.1.14 of B-SAR-205 for Babcock & Wilcox plants.

(3) Same as item (4) above for General Electric plants.

(4) Topical Report WCAP-8822 for Westinghouse plants. (Although this Topical Report is currently under review, the use of this method is acceptable in the interim if no entrainment is assumed. Reanalysis may be required following the NRC staff review of the entrainment model as presently described.)

APPENDIX B

SAMPLE CALCULATION AND TYPE METHODOLOGY FOR RADIATION QUALIFICATION DOSE

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SAMPLE CALCULATION AND TYPE METHODOLOGY FOR RADIATION QUALIFICATION DOSE

This appendix illustrates the staff model for calculating dose rates and integrated doses for equipment qualification purposes. The doses shown in Figure B-1 below include contributions from several dose point locations in the containment and cover a period of one year following the postulated fission product release. The dose values shown here are provided for illustration only and may not be appropriate for plant specific application for equipment qualification levels. The dose levels intended for qualification purposes should be determined using the maximum time the equipment is intended to function which, for the design basis LOCA event, may well exceed one year.

The beta and gamma integrated doses presented in Tables B-1 and B-2 and Figure B-1 below, have been determined using models and assumptions consistent with those of Regulatory Guide 1.7. This analysis is conservative, and factors in the important time-dependent phenomena related to the action of engineered safety features (ESFs) and natural phenomena, such as iodine plate-out, as done in previous staff analyses.

Doses were calculated for two points inside the containment; at the midpoint of the containment (taking sprays and plate-out mechanisms into account), and near the surface of the sump water. The doses presented in Figure B-1 are values for a PWR plant having a containment free-volume of 2.5 million cubic feet and a power rating of 4100 MWt.

1.0 Basic Assumptions Used in the Analysis

Gamma and beta doses and dose rates were determined for three types of radioactive source distributions: (1) from activity suspended in the containment atmosphere, (2) from activity plated out on containment surfaces, and (3) from activity mixed in the containment sump water. Thus, a given piece of equipment may receive a dose contribution from any or all of these sources. The amount of dose contributed by each of these sources is determined by the location of the equipment, the time-dependent and location-dependent distribution of the source, and the effects of shielding.

Following the Three Mile Island Unit 2 (TMI-2) accident, the staff concluded that a thorough examination of the source term assumptions for equipment qualification was warranted. It is recognized, however, that the TMI-2 accident represents only one of a number of possible accident sequences leading to a release of fission products, and that the mix of fission products released under various core conditions could vary substantially. Current rulemaking proceedings are reevaluating plant siting policy, degraded cores, minimum requirements for engineered safety features and emergency preparedness. These rulemaking activities also included an examination of fission product releases under degraded core conditions. While the final resolution of the source term assumptions is conditioned on the completion of these rulemaking efforts, the staff believes it is prudent to incorporate the knowledge gained of fission product behavior from the TMI-2 accident in defining source term assumptions for equipment qualification.

Based upon release estimates in the Rogovin Report (Ref. 1), the staff assumptions for noble gas and iodine releases are still conservative. However, the report estimates that the TMI-2 release contained between 40 and 60 percent of the Cs-134 and Cs-137 core activity in the primary system water, in the containment sump water, and in the auxiliary building tank. Comparison of the integrated dose from the TMI-2 cesium release to the previous staff assumption of "1% solids" shows that the "1% solids" assumption may not be conservative for equipment required to function for time periods exceeding thirty days. The staff feels that as a first step toward modification of the TID-14844 source term in the direction indicated by the TMI-2 experience, it may be prudent to factor in a cesium release in addition to the previously assumed "1% solids." As a result, the revised regulatory positions propose a cesium release of 50 percent of the core activity inventory (see Positions C.3.d(1) and (2). The assumed cesium release implies no substantial departure from, and is consistent with, the degraded core conditions previously implied by the assumed release of a 50 percent core iodine activity. This change in assumptions would have particular significance for the qualification of equipment in the vicinity of recirculating fluids and for equipment required to function for time periods exceeding 30 days.

The assumption of concurrent release of cesium and iodine also is consistent with the findings of recent source term studies reported in NUREG-0772 (Ref. 2). This report also concluded that the expected predominant form of iodine released during accidents is cesium iodide (CsI). Although the CsI form is not specifically addressed in this report, it is evident that either CsI, or I_2 and Cs would, in the long term, be located primarily in the reactor water and the containment sump water (PWR) or suppression pool (BWR). The staff recognizes that the revised source terms contained in this report are interim values and that the conclusions from the report cited above, as well as further results from current research efforts in the source term area, should ultimately form the basis for any revision of source term assumptions. Any revision of the source term assumptions, such as the incorporation of additional radionuclides, would be factored into the guide before it is issued as an effective guide.

2.0 Assumptions Used in Calculating Fission Produce Concentrations

This section discusses the assumptions used to simulate the PWR and BWR containments for determining the time-dependent and location-dependent distribution of noble gases and iodines airborne within the containment atmosphere, plated out on containment surfaces, and in the sump water.

The staff has developed a computer program, TACT, (to be published) that models the time-dependent behavior of iodine and noble gases within a nuclear power plant. The TACT code is used routinely by the staff for the calculation of the offsite radiological consequences of a LOCA, and is an acceptable method for modeling the transfer of activity from one containment region to another and in modeling the reduction of activity due to the action of ESFs. Another staff code, SPIRT (Ref. 3), is used to calculate the removal rates of elemental iodine by plate-out and sprays. These codes were used to develop the source term estimates. The following assumptions were also used to calculate the distribution of radioactivity within the containment following a design basis LOCA.

2.1 PWR Dry Containments

a. The source terms used in the analysis assumes that 50 percent of the core iodines and 100 percent of the core noble gases were released instantaneously to the containment atmosphere, 50 percent of the core inventory of cesium and 1% of the remaining "solid" activity inventory is released from the core and carried with the primary coolant directly to the containment sump. (Note: The integrated dose from a "1% solids" release of TID 14844 is approximately equal to the integrated dose from 50 percent cesium release for the initial 30-day period.)

b. The containment free volume was taken as 2.52×10^6 ft^3. Of this volume, 74 percent or 1.86×10^6 ft^3 is assumed to be directly covered by the containment sprays. (Plants with different containment free volumes should use plant specific valves.)

c. 6.6×10^5 ft^3 of the containment free volume is assumed unsprayed, which includes regions within the main containment space under the containment dome and compartments below the operating floor level.

d. The ESF fans are assumed to have a design flow rate of 220,000 cfm in the post-LOCA environment. Mixing between all major unsprayed regions and compartments and the main sprayed region is assured.

e. Air exchange between the sprayed and unsprayed region was assumed to be one-half of the design flow rate of ESF fans. Good mixing of the containment activity between the sprayed and unsprayed regions is assured by natural convection currents and ESF fans.

f. The containment spray system was assumed to have two equal capacity trains, each designed to inject 3000 gpm of boric acid solution into the containment.

g. Trace levels of hydrazine was assumed added to enhance the removal of iodine.

h. The spray removal rate constant (lambda) was assumed and calculated using the staff's SPIRT program, conservatively assuming only one spray train operation and an elemental iodine instantaneous partition coefficient (H) of 5000. The calculated value of the elemental iodine spray removal constant was 27.2 hr^{-1}.

i. Plate-out of iodine on containment internal surfaces was modeled as a first-order rate removal process and best estimates for model parameters were assumed. Based on an assumed total surface area within containment of approximately 5.0×10^5 ft^2. The calculated value for the overall elemental iodine plate-out constant was 1.23 hr^{-1}. The assumption that 50 percent of the activity is instantaneously plated-out should not be used.

j. The spray removal and plate-out process were modeled as competing iodine removal mechanisms.

k. A spray removal rate constant (λ) for particulate iodine concentration was calculated using the staff's SPIRT program (Ref. 2). The staff calculated a value of λ = 0.43 hr^{-1} and allowed the removal of particulate iodine to continue until the airborne concentration was reduced by a factor of 10^4. The organic iodine concentration in the containment atmosphere is assumed not to be affected by either the containment spray or plate-out removal mechanisms.

l. The sprays were assumed to remove elemental iodine until the instantaneous concentration in the sprayed region was reduced by a factor of 200. This is necessary to achieve an equilibrium airborne iodine concentration consistent with previous LOCA analyses.

m. A relatively open (not compartmented) containment was assumed, and the large release was uniformly distributed in the containment. This is an adequate simplification for dose assessment in a PWR containment, and realistic in terms of specifying the time-dependent radiation environment in most areas of the containment.

n. The analysis assumed that more than one species of radioactive iodine is present in a design basis LOCA. The calculation of the post-LOCA environment assumed that 2.5 percent of the core inventory of the iodine released is associated with airborne particulate materials and 2 percent of the core inventory of the iodine released formed organic compounds. The remaining 95.5 percent remained as elemental iodine. For conservatism this composition was assumed present at time t = o. (These assumptions concerning the iodine form are consistent with those of Regulatory Guides 1.3 and 1.4 when a plate-out factor of 2 is assumed for the elemental form.)

o. For all containments, no leakage from the containment building to the environment was assumed.

p. Removal of airborne activity by engineered safety features may be assumed when calculating the radiation environment following other non-LOCA design basis accidents provided the safety features systems are automatically activated as a result of the accident.

2.2 PWR Ice Condenser Containments

The assumptions and methods presented for the calculation of the radiation environment in PWR dry containments are appropriate for use in calculating the radiation environment following a design basis LOCA for ice condenser containments with the following modifications:

a. The source should be assumed to be initially released to the lower containment compartment. The distribution of the activity should be based on the forced recirculation fan flow rates and the transfer rates through the ice beds as a function of time.

b. Credit may be taken for iodine removal via the operation of the ice beds and the spray system. A time-dependent removal efficiency consistent with the steam/air mixture for elemental iodine may be assumed.

c. Removal of airborne iodine in the upper compartment of the containment by the action of both plate-out and spray processes may be assumed provided that these removal processes are evaluated using the assumptions consistent with items h through l in Section 2.1 above and plant-specific parameters.

2.3 BWR Containments

The assumptions and methods presented for the calculation of the radiation environment in PWR dry containments are appropriate for use in calculating the radiation environment following a design basis LOCA for BWR's with the following modifications:

a. A decontamination factor (DF) of 10 should be assumed for both the elemental and particulate iodine as the iodine activity passes through the suppression pool. No credit should be taken for the removal of organic iodine or noble gases in the suppression pool.

b. For Mark III designs, all of the activity passing through the suppression pool should be assumed instantaneously and uniformly distributed within the containment. For the Mark I and Mark II designs, all of the activity should be assumed initially released to the dry well area and the transfer of activity from these regions via containment leakage to the surrounding reactor building volume should be used to predict the qualification levels within the reactor building (secondary containment).

c. Removal of airborne iodine in the dry well or reactor building by both the plate-out and the spray process may be assumed provided the effectiveness of these competing iodine removal processes are evaluated using the assumptions consistent with items h through l in Section 2.1 above and plant-specific parameters.

d. The removal of airborne activity from the reactor building by operation of the Standby Gas Treatment System (SGTS) may be assumed.

3.0 Model for Calculating the Dose Rate of Airborne and Plate-out Fission Products

The beta and gamma dose rates and integrated doses from the airborne activity within the containment atmosphere were calculated for a midpoint in the containment. The containment was modeled as a cylinder of equal height and diameter. Containment shielding and internal structures were neglected.

Because of the short range of the betas in air, the airborne beta doses were calcualted using an infinite medium approximation. This is shown in Reference 4 to result in only a small error. The airborne beta doses are not expected to be significantly reduced by the presence of containment internal structures. For beta dose calculations for equipment located on the containment walls or on large internal structures, the semi-infinite beta dose model may be used.

The gamma dose rate contribution from the plated-out iodine on containment surfaces to the point on the centerline was also included. The model calculated the plate-out activity in the containment assuming only one spray train and one ventilation system were operating. It should be noted that wash-off by the sprays of the plated-out iodine activity was not addressed in this evaluation.

Finally, all gamma doses were multiplied by a correction factor of 1.3 as suggested in Reference 4 to account for the omission of the contribution from the decay chains of the isotopes.

4.0 Model for Calculating the Dose Rate of Sump Fission Products

The staff model assumed the washout of airborne iodine from the containment atmosphere to the containment sump. For a PWR containment with sprays and good mixing between the sprayed and unsprayed regions, the elemental iodine (assumed constituting 91 percent of the released iodine) is very rapidly washed out of the atmosphere to the containment sump (typically, 90 percent of the airborne iodine in less than 15 minutes).

The dose calculations assumed a time-dependent iodine source. (The difference between the integrated dose assuming 50 percent of the core iodine immediately available in the sump versus a time-dependent sump iodine buildup is not significant.)

The "solid" fission products should be assumed instantaneously carried by the coolant to the sump and uniformly distributed in the sump water. The gamma and beta dose rates and the integrated doses should be computed for a center point located at the surface of the large pool of sump water and the dose rates should be calculated including an estimate of the effects of buildup.

5.0 Conclusion

The values given in Tables B-1 and B-2 and Figure B-1 for the various locations in the containment provide an estimate of expected radiation qualification values for a 4100 MWt PWR design.

The NRC Office of Research is continuing its research efforts in the area of source terms for equipment qualification following design basis accidents. As more information in this area becomes available, the source terms and staff models may change to reflect the new information.

TABLE B-1

SUMMARY TABLE OF ESTIMATES FOR
TOTAL AIRBORNE GAMMA DOSE CONTRIBUTORS
IN CONTAINMENT TO A POINT IN THE CONTAINMENT CENTER

TIME (HRS)	AIRBORNE IODINE DOSE (R)	AIRBORNE NOBLE GAS DOSE (R)	PLATE-OUT IODINE DOSE (R)	TOTAL DOSE (R)
0.00	-	-	-	-
0.03	4.82+4	7.42E+4	1.69+3	1.24E+5
0.06	8.57+4	1.39E+5	3.98+3	2.29E+5
0.09	1.09+5	1.98E+5	7.22+3	3.14E+5
0.12	1.25+5	2.51E+5	1.10+4	3.87E+5
0.15	1.38+5	3.01E+5	1.52+4	4.54E+5
0.18	1.47+5	3.48E+5	1.96+4	5.15E+5
0.21	1.55+5	3.92E+5	2.41+4	5.71E+5
0.25	1.64+5	4.49E+5	3.03+4	6.43E+5
0.38	1.87+5	6.19E+5	5.05+4	8.57E+5
0.50	2.03+5	7.61E+5	6.90+4	1.03E+6
0.75	2.36+5	1.03E+6	1.06+5	1.37E+6
1.00	2.66+5	1.26E+6	1.40+5	1.67E+6
2.00	3.62+5	2.04E+6	2.61+5	2.66E+6
5.00	5.50+5	3.56E+6	5.40+5	4.65E+6
8.00	6.63+5	4.38E+6	7.47+5	5.79E+6
24.0	1.01+6	6.26E+6	1.45+6	8.72E+6
60.0	1.31+6	7.16E+6	2.10+6	1.06E+7
96.0	1.45+6	7.56E+6	2.39+6	1.14E+7
192.	1.68+6	8.29E+6	2.86+6	1.28E+7
298.	1.85+6	8.76E+6	3.19+6	1.38E+7
394.	1.95+6	8.85E+6	3.41+6	1.42E+7
560.	2.07+6	9.06E+6	3.64+6	1.48E+7
720.	2.13+6	9.15E+6	3.76+6	1.50E+7
888.	2.16+6	9.19E+6	3.83+6	1.52E+7
1060	2.18+6	9.21E+6	3.87+6	1.53E+6
1220	2.19+6	9.21E+6	3.89+6	1.53E+7
1390	2.20+6	9.21E+6	3.90+6	1.53E+7
1560	2.20E+6	9.22E+6	3.91+6	1.53E+7
1730	2.20E+6	9.22E+6	3.91+6	1.53E+7
1900	2.20E+6	9.22E+6	3.92+6	1.53E+7
2060	2.20E+6	9.22E+6	3.92E+6	1.53E+7
2230	2.20E+6	9.22E+6	3.92E+6	1.53E+7
2950	2.20E+6	9.23E+6	3.92E+6	1.54E+7
3670	2.20E+6	9.24E+6	3.92E+6	1.54E+7
4390	2.20E+6	9.24E+6	3.92E+6	1.54E+7
5110	2.20E+6	9.25E+6	3.92E+6	1.54E+7
5830	2.20E+6	9.25E+6	3.92E+6	1.54E+7
6550	2.20E+6	9.26E+6	3.92E+6	1.54E+7
7270	2.20E+6	9.26E+6	3.92E+6	1.54E+7
8000	2.20E+6	9.27E+6	3.92E+6	1.54E+7
8710	2.20+6	9.28E+6	3.92+6	1.54E+7
			TOTAL	1.54E+7

TABLE B-2

SUMMARY TABLE OF ESTIMATES FOR
TOTAL AIRBORNE BETA DOSE CONTRIBUTORS
IN CONTAINMENT TO A POINT IN THE CONTAINMENT CENTER

TIME (HRS)	AIRBORNE IODINE DOSE (RADS)+	AIRBORNE NOBLE GAS DOSE (RADS)+	TOTAL DOSE (RADS)+
0.00	-	-	-
0.03	1.47+5	5.48+5	6.95+5
0.06	2.62+5	9.86+5	1.25+6
0.09	3.33+5	1.35+5	1.68+6
0.12	3.83+5	1.65+6	2.03+6
0.15	4.20+5	1.91+6	2.33+6
0.18	4.49+5	2.14+6	2.59+6
0.21	4.73+5	2.35+6	2.82+6
0.25	5.00+5	2.60+6	3.10+6
0.38	5.67+5	3.30+6	3.87+6
0.50	6.15+5	3.86+6	4.48+6
0.75	7.13+5	4.89+6	5.60+6
1.00	8.00+5	5.81+6	6.61+6
2.00	1.07+6	9.02+6	1.01+7
5.00	1.58+6	1.65+7	1.81+7
8.00	1.88+6	2.20+7	2.39+7
24.0	2.87+6	4.08+7	4.37+8
60.0	3.89+6	6.15+7	6.54+7
96.0	4.37+6	7.48+7	7.92+7
192.	5.14+6	1.00+8	1.05+8
298.	5.64+6	1.17+8	1.23+8
394.	5.99+6	1.25+8	1.31+8
560.	6.34+6	1.34+8	1.40+8
720.	6.53+6	1.39+8	1.46+8
888.	6.63+6	1.42+8	1.49+8
1060	6.69+6	1.44+8	1.51+8
1220	6.73+6	1.45+8	1.52+8
1390	6.75+6	1.47+8	1.54+8
1560	6.76+6	1.49+8	1.56+8
1730	6.76+6	1.51+8	1.58+8
1900	6.76+6	1.52+8	1.59+8
2060	6.76+6	1.54+8	1.61+8
2230	6.77+6	1.55+8	1.62+8
2950	6.77+6	1.62+8	1.69+8
3670	6.77+6	1.69+8	1.76+8
4390	6.77+6	1.76+8	1.83+8
5110	6.77+6	1.83+8	1.90+8
5830	6.77+6	1.89+8	1.96+8
6550	6.77+6	1.96+8	2.03+8
7270	6.77+6	2.03+8	2.10+8
8000	6.77+6	2.09+8	2.16+8
8710	6.77+6	2.16+8	2.23+8
		TOTAL	2.23+8

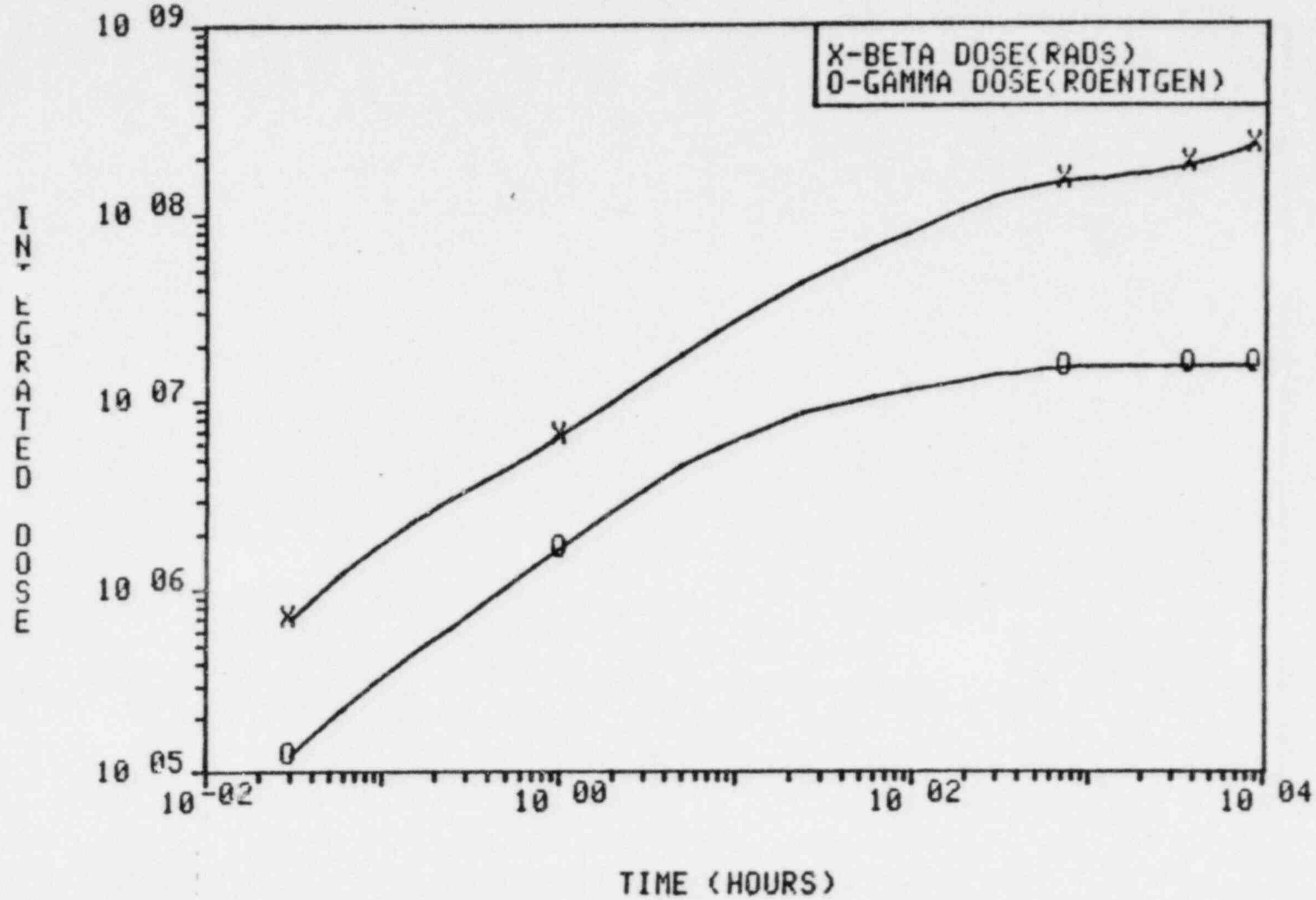

Figure B-1 Sample airborne doses for a dose point on the containment centerline

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APPENDIX C

QUALIFICATION DOCUMENTATION FOR ELECTRIC EQUIPMENT IMPORTANT TO SAFETY

APPENDIX C

QUALIFICATION DOCUMENTATION FOR ELECTRIC EQUIPMENT IMPORTANT TO SAFETY

In order to ensure that an environmental qualification program conforms with General Design Criteria 1, 2, 4 and 23 of Appendix A and Sections III and XI of Appendix B to 10 CFR Part 50, and to the national standards mentioned in Part II "Acceptance Criteria" (which includes IEEE Std. 323) contained in Standard Review Plan Section 3.11, the following information on the qualification program is required for all electric equipment important to safety.

1. Identify all electric equipment important to safety and provide the following:
   a. Type (functional designation)
   b. Manufacturer
   c. Manufacturer's type number and model number
   d. The equipment should include the following, as applicable:
      (1) Switchgear
      (2) Motor control centers
      (3) Valve operators
      (4) Motors
      (5) Logic equipment
      (6) Cable
      (7) Diesel generator control equipment
      (8) Sensors (pressure, pressure differential, temperature and neutron)
      (9) Limit switches
      (10) Heaters
      (11) Fans
      (12) Control boards
      (13) Instrument racks and panels
      (14) Connectors
      (15) Electrical penetrations
      (16) Splices
      (17) Terminal blocks

2. Categorize the equipment identified in item 1 above into one of the following categories:

   a. Equipment that will experience the environmental conditions of design basis accidents for which it must function to mitigate said accidents, and that will be qualified to demonstrate operability in the accident environment for the time required for accident mitigation with safety margin to failure.

   b. Equipment that will experience environmental conditions of design basis accidents through which it need not function for mitigation of said accidents, but through which it must not fail in a manner detrimental to plant safety or accident mitigation, and that will be qualified to demonstrate the capability to withstand any accident environment for the time during which it must not fail with safety margin to failure.

c. Equipment that will experience environmental conditions of design basis accidents through which it need not function for mitigation of said accidents, and whose failure (in any mode) is deemed not detrimental to plant safety or accident mitigation, and need not be qualified for any accident environment, but will be qualified for its non-accident service environment.

d. Equipment that will not experience environmental conditions of design basis accidents and that will be qualified to demonstrate operability under the expected extremes of its non-accident service environment. This equipment would normally be located outside the reactor containment.

3. For each type of equipment in the categories of equipment listed in item 2 above, provide separately the equipment design specification requirements, including:

   a. The system safety function requirements.

   b. An environmental envelope as a function of time that includes all extreme parameters, both maximum and minimum values, expected to occur during plant shutdown, normal operation, abnormal operation, and any design basis event (including LOCA and MSLB), including post-event conditions.

   c. Time required to fulfill its safety function when subjected to any of the extremes of the environment envelope specified above.

   d. Technical bases should be provided to justify the placement of each type equipment in the categories 2.b and 2.c listed above.

4. Provide the qualification test plan, test setup, test procedures, and acceptance criteria for at least one of each group of equipment of item 1.d as appropriate to the category identified in item 2 above. If any method other than type testing was used for qualification (operating experience, analysis, combined qualification, or ongoing qualification), describe the method in sufficient detail to permit evaluation of its adequacy.

5. For each category of equipment identified in item 2 above, state the actual qualification envelope simulated during testing (defining the duration of the hostile environment and the margin in excess of the design requirements). If any method other than type testing was used for qualification, identify the method and define the equivalent "qualification envelope" so derived.

6. A summary of test results that demonstrates the adequacy of the qualification program. If analysis is used for qualification, justification of all analysis assumptions must be provided.

7. Identification of the qualification documents which contain detailed supporting information, including test data, for items 4, 5, and 6.

JULY 10, 1981

A NEW § 50.49 IS ADDED TO READ:

§ 50.49 ENVIRONMENTAL AND SEISMIC QUALIFICATION OF ELECTRIC EQUIPMENT IMPORTANT TO SAFETY FOR NUCLEAR POWER PLANTS.

CONTACT:

SATISH K. AGGARWAL
U. S. NUCLEAR REGULATORY COMMISSION
WASHINGTON, DC 20555
(301) 443-5946

ELECTRIC EQUIPMENT IMPORTANT TO SAFETY MEANS THOSE ELECTRICALLY OPERATED, ACTUATED, OR ENERGIZED COMPONENTS NECESSARY FOR THE PROPER OPERATION OF SYSTEMS IMPORTANT TO SAFETY.

SUCH SYSTEMS INCLUDE SYSTEMS REQUIRED TO MITIGATE THE CONSEQUENCES OF AN ACCIDENT AND THOSE SYSTEMS WHOSE FAILURE OR MALFUNCTION COULD CAUSE AN ACCIDENT OR CAUSE AN ACCIDENT IN PROCESS TO WORSEN.

INCLUDED ARE (1) SYSTEMS REQUIRED FOR REACTIVITY CONTROL, (2) SYSTEMS REQUIRED FOR REACTOR AND PROCESS SYSTEM HEAT CONTROL, (3) SYSTEMS REQUIRED FOR CONTAINMENT ISOLATION, (4) SYSTEMS REQUIRED FOR MAINTAINING CONTAINMENT INTEGRITY, (5) SYSTEMS REQUIRED FOR PREVENTING SIGNIFICANT RELEASE OF RADIOACTIVE MATERIAL TO THE ENVIRONMENT, (6) INSTRUMENTATION ESSENTIAL FOR OPERATOR ACTION IN ACCOMPLISHING (1) THROUGH (5), AND (7) EQUIPMENT THAT COULD FAIL IN SUCH A MANNER THAT THE FAILURE WOULD PREVENT THE PROPER OPERATION OF EQUIPMENT IMPORTANT TO SAFETY, OR MISLEAD THE OPERATOR.

A LIST OF ALL ELECTRIC EQUIPMENT IMPORTANT TO SAFETY SHALL BE PREPARED AND MAINTAINED IN A CENTRAL FILE. THIS LIST SHALL, AS A MINIMUM, INCLUDE:

(1) THE PERFORMANCE CHARACTERISTICS (SUCH AS ACCURACY AND RESPONSE TIME) AND INTEGRITY REQUIREMENTS UNDER CONDITIONS EXISTING DURING NORMAL AND ABNORMAL OPERATION, DURING THE CONTAINMENT TEST, AND DURING DESIGN BASIS EVENTS AND AFTERWARDS AND THE TIMES THAT INTEGRITY MUST BE MAINTAINED.

(2) THE RANGE OF VOLTAGE, FREQUENCY, AND OTHER ELECTRICAL CHARACTERISTICS

(3) THE ENVIRONMENTAL CONDITIONS INCLUDING TEMPERATURE, PRESSURE, HUMIDITY, RADIATION, CHEMICALS, SUBMERGENCE, VIBRATION, AND SEISMIC FORCES AND THEIR PREDICTED VARIATIONS WITH TIME (AT THE LOCATION WHERE THE EQUIPMENT MUST PERFORM).

THE QUALIFICATION PROGRAM SHALL INCLUDE THE FOLLOWING:

(1) KNOWN SYNERGISTIC EFFECTS

(2) AGING

AGING CONSIDERATIONS BASED ON SEISMIC AND DYNAMIC LOADS SHALL INCLUDE A JUSTIFIABLE NUMBER OF OPERATING BASIS EARTHQUAKES AND OTHER DYNAMIC (CYCLIC) LOADING EFFECTS.

(3) MARGINS.

(4) TEMPERATURE AND PRESSURE.

(5) HUMIDITY.

(6) CHEMICAL EFFECTS.

(7) RADIATION.

(8) SUBMERGENCE.

(9) SEISMIC AND VIBRATORY LOADS.

EACH ITEM OF ELECTRIC EQUIPMENT IMPORTANT TO SAFETY SHALL BE QUALIFIED BY ONE OF THE FOLLOWING METHODS:

(1) TESTING AN IDENTICAL ITEM OF EQUIPMENT.

(2) TESTING A SIMILAR ITEM OF EQUIPMENT WITH A SUPPORTING ANALYSIS TO SHOW THAT THE EQUIPMENT TO BE QUALIFIED IS ACCEPTABLE.

(3) EXPERIENCE WITH IDENTICAL OR SIMILAR EQUIPMENT UNDER SIMILAR CONDITIONS WITH A SUPPORTING ANALYSIS TO SHOW THAT THE EQUIPMENT TO BE QUALIFIED IS ACCEPTABLE.

(4) ANALYSIS A' NE, SUBJECT TO THE APPROVAL OF THE NRC STAFF IN THE FOLLOWING CASES--

(i) TYPE TESTING IS PRECLUDED BY THE PHYSICAL SIZE OF THE EQUIPMENT OR BY THE STATE-OF-THE-ART;

(II) THE EQUIPMENT WAS INSTALLED PRIOR TO MAY 23, 1980.

INSTALLED ELECTRIC EQUIPMENT IMPORTANT TO SAFETY SHALL BE SUBJECTED TO ADEQUATE PROGRAMS OF PREVENTIVE MAINTENANCE AND QUALITY ASSURANCE, INCLUDING ROUTINE MAINTENANCE TO MINIMIZE DUST ACCUMULATION THAT COULD DEGRADE THE ABILITY OF THE EQUIPMENT TO FUNCTION PROPERLY.

A RECORD OF THE QUALIFICATION SHALL BE MAINTAINED IN A CENTRAL FILE TO PERMIT VERIFICATION.

REVISION 1 TO REGULATORY GUIDE 1.89 HI-LIGHTS

I - THE SCOPE OF THE GUIDE IS CHANGED TO INCLUDE QUALIFICATION OF ALL ELECTRIC EQUIPMENT IMPORTANT TO SAFETY, NOT JUST CLASS 1E EQUIPMENT. ("CLASS 1E" IS A SUBSET OF "IMPORTANT TO SAFETY.")

II - GUIDANCE IS PROVIDED IN ESTABLISHING CONTAINMENT PRESSURE AND TEMPERATURE ENVELOPES INSIDE CONTAINMENT FOR A LOCA.

III - GUIDANCE IS PROVIDED IN ESTABLISHING CONTAINMENT PRESSURE AND TEMPERATURE FOR A MSLB.

IV - GUIDELINES FOR THE CHEMICAL SPRAY SOLUTION ARE PROVIDED.

V - THE RADIATION SOURCE TERM HAS BEEN UPDATED BASED ON THE TMI-2 EXPERIENCE, AND GUIDANCE IN USING THE TERM IS PROVIDED.

A - FOR A LOCA WHERE THE BREAK CANNOT BE ISOLATED -

100% OF THE CORE ACTIVITY INVENTORY OF NOBLE GAS

50% OF THE CORE ACTIVITY INVENTORY OF HALOGENS INSTANTANEOUSLY RELEASED FROM THE FUEL TO THE CONTAINMENT

50% OF CESIUM ACTIVITY

1% OF THE REMAINING SOLIDS ACTIVITY INVENTORY INSTANTANEOUSLY RELEASED FROM THE FUEL TO THE PRIMARY COOLANT AND CARRIED BY THE COOLANT TO THE CONTAINMENT SUMP

B - FOR A LOCA WHERE THE BREAK CAN BE ISOLATED -

COMPOSITION AS ABOVE ASSUMED TO BE INSTANTANEOUSLY RELEASED (AFTER AN INITIAL TIME DELAY) AND CIRCULATED IN THE PRIMARY COOLANT SYSTEM

C - FOR ALL OTHER DESIGN BASIS ACCIDENTS -

QUALIFICATION SOURCE TERM SHOULD BE CALCULATED FACTORING IN THE PERCENT OF FUEL DAMAGE ASSUMED IN THE PLANT SPECIFIC ANALYSIS

VI - A SOURCE TERM TO BE USED IN THE QUALIFICATION OF CERTAIN HIGH-RANGE ACCIDENT MONITORING INSTRUMENTATION IS PROVIDED.

ACCEPTABLE OF FRACTIONAL RELEASE FOR EACH GROUP IS:

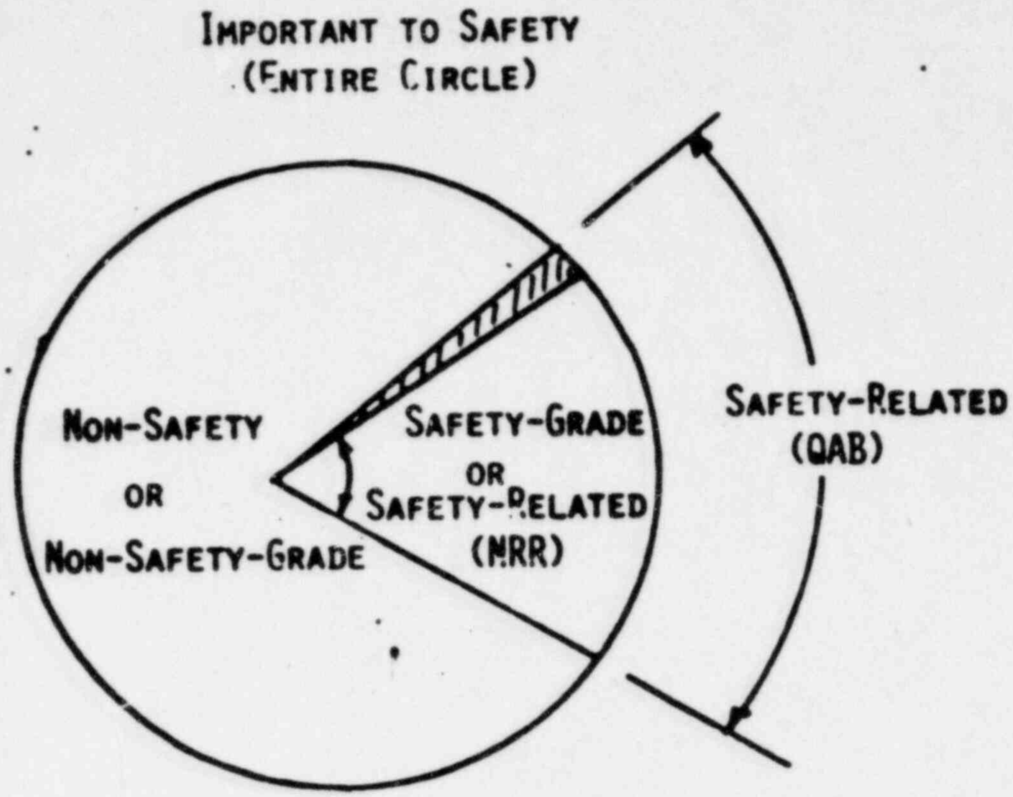
NOBLE GASES: I, Br; Ca, Rb; Te	100%
Sr, Ba	11%
Ru	8%
La	1.3%

VII - GUIDANCE IN ESTABLISHING ENVIRONMENTAL CONDITIONS OUTSIDE CONTAINMENT IS PROVIDED.

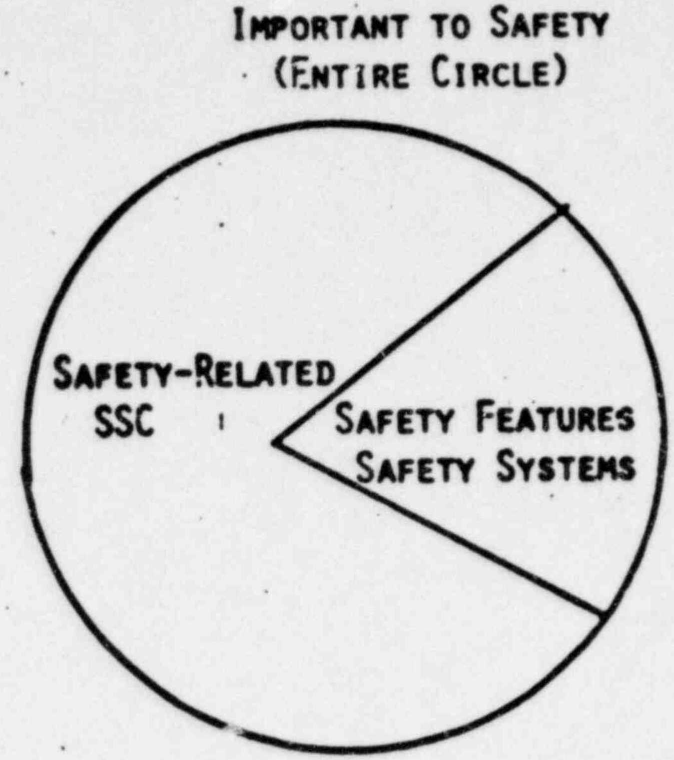
VIII - THE STAFF POSITION IN QUALIFYING EQUIPMENT IN A MILD ENVIRONMENT IS THAT TESTING IS NOT REQUIRED.

A MILD ENVIRONMENT IS AN ENVIRONMENT THAT, UNDER ANY POSTULATED ACCIDENT CONDITION, WOULD BE NO MORE SEVERE THAN THE ENVIRONMENT THAT WOULD OCCUR DURING NORMAL POWER PLANT OPERATION OR DURING ANTICIPATED OPERATIONAL OCCURRENCES.

SAFETY CLASSIFICATIONS
NRC vs IAEA



NRR/QAB



IAEA