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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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PUBLIC WORKSHOP

ON

TECHNICAL AND POLICY CONSIDERATIONS

FOR

NUCLEAR POWER PLANT LICENSE RENEWAL

*****

ELECTRICAL and I&C SYSTEMS

SESSION 7

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Sheraton Resort Hotel

Conference Rooms A, B and C

11810 Sunrise Valley Drive

Reston, Virginia

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Tuesday, November 14, 1989

8:30 a.m.

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SESSION LEADERS:

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Milton Vagins, Chief, Electrical and Mechanical Engineering Branch, Division of Engineering

PARTICIPANTS:

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PROCEEDINGS

(3:30 a.m.)

MR. THADANI: Let's begin Session No. 7 on Electrical Systems. I am Ashok Thadani, director, Division of System Technology, the office of Nuclear Reactor Regulations. Co-chairing this session is Mr. Milt Vagins. He is chief, Electrical and Mechanical Engineering Branch, Division of Engineering.

Our purpose here is to receive comments from your discussions and questions. Before we get started, Milt has a short presentation to try to focus our attention on the specific issues. Milt.

MR. VAGINS: Those of you who are in the session, before I start, I'd like to do a little housekeeping. Can you hear in the back? The transcripts will be available of all the sessions of the workshop. I would like for all prepared speakers to give us a copy of their viewgraphs, if they have them. The transcripts will be available from Ann Riley & Associates, 1612 K Street, N.W., suite 300, Washington, D.C. 20006.

Again, before we begin, I want to reiterate what the basic concepts of the License Renewal Rulemaking is following in the area of technical issues, and there are four basic driving requirements. The rule will define or specify a proposed screening process of equipment and

structures. It will define some structures systems and components for evaluation, some for exclusion. It will define a specific set of degradation mechanisms for evaluation and also define requirements for corrective action when degradation is not being monitored. This is the basic overall philosophy. We tie that together with the understanding, the basic logic of license renewal, and that can be expressed in four simple words, "assurance of continued safe operation." No enhancement, but assurance of continued safe operation. That is the key, and that is what we'll be driving to.

The questions that were sent out to you on the original set of questions were six. Question three, which dealt with industry experience with electrical equipment which exhibit high failure rates during their design life was inadvertently built in. It was decided by the staff that that is really a today issue. If we are experiencing -- and I say if we are experiencing a high failure rate of equipment today, then we must solve that problem. It is to not a license renewal issue. So that kind of question will not be addressed unless somebody really wants to address it. But again, understanding if we have a problem today is incumbent upon both the industry and the NRC to solve that problem.

VOICE: You would expect on the written responses

that would not be addressed?

MR. VAGINS: Again, I think the written responses would be irrelevant because it's not a license renewal issue. I regret and I apologize that that did creep in. It is contra to everything else we've done. The key word, again, is today issues to be solved today. License renewal will address those issues which are not defined or resolved and by the degradation of something beyond the scope of the present license.

In that case, let's look at the five remaining questions, and I'll paraphrase them. The first one is what additional criteria for electrical equipment included in the EQ program, but not periodically replaced, is required. The big question here, of course, is cable, cables within containment. How do you propose, or how do you suggest that we deal with equipment that is EQ to end of life no further, and is going to be very, very difficult to replace.

The second question dealt with additional programs to address aging degradation of electrical equipment located in mild environments. Again, not subject to EQ as is the case with equipment subject to harsh environments.

Third is: programs to establish the in situ condition of cable and components and the potential for

future degradation. Again, to a great deal this goes back to cable. But it also deals with electrical equipment that is not normally followed too closely. Some of that will be relays, for instance, for requirements for electrical equipment important to safety. That is an electrical question. How do we deal specifically with electrical equipment? Again, the importance is not necessarily safety related.

Fifth was functional testing of electrical equipment as a prerequisite for license renewal. Is functional testing or new baseline testing of value or importance or need? We would like your input on that.

Let's talk a little bit about the electrical systems themselves. Just an example, so we're all talking about the same thing, we have those electrical systems relied upon for the integrity of pressure boundary and to effect safe shutdowns and accident prevention and mitigation. I've listed some of the equipment. We all know reactor protection system and engineered safety features, are Class 1. But then there are other systems, electrical systems, whose failure can cause or adversely affect a transient or accident, significantly challenge structures, systems and components relied upon for the integrity of the reactor coolant pressure boundary, safe shutdowns, or mitigation and, of course, main generator

and reactor control system and switchyard. Failure of these components challenge the system. In some cases the switch-off failure leading to station blackout seriously challenges our safety systems.

This is just a short, very short, and hardly, by no means, comprehensive list, but just to give you an idea of breakdowns to various areas of equipment we're looking at. We're certainly looking at the importance of balance of plant in license renewal.

With that brief summary, I'll open the floor to questions. Then we will move into the prepared statements. Are there any question or comments about what I just said? Please stand up and identify yourself and talk into the microphone.

MR. COZENS: I'm Kirt Cozens, NUMARC, and I just wanted to verify your use of the term "challenge to safety" in connection to important to safety systems. Does this go beyond the definition of important to safety that has been written in the NRC rule and also beyond what the industry has proposed for screening structures, systems and components for degradation.

MR. VAGINS: It depends on what the industry screens and how you define what the rule is. When we say challenge to safety -- importance to safety, if a system fails which prevents a safety system from working, then,

yes, that is in the rule, the proposed rule. The question is how far beyond. For instance, if a switch yard, if that fails, we face severe problems, and yet that is not really defined as safety related or -- obviously it's important to safety. So should we deal with it? It's also a system in which we have determined that transformers age. Those are part of the aging programs, so the question becomes: we'd like to know your views of how we treat these other systems. We want your input.

MR. THADANI: As you know, there was a session yesterday, there was considerrable discussion on this specific issue in the screening techniques session. The question was raised on the initiator important to safety. There is no question about what the answer is; they are in fact very important. They impact safety.

The question was raised, well, is that part of equipment important to safety and does that include any initiation? The language, if I were to take a look at the language, one could interpret it any way one wants. The response from certainly one industry member was that you pick up some of those systems simply because you're looking at mitigating systems. If you are looking at the definition of important to safety, I think the words are something like "systems are required to prevent or mitigate accidents"; and so you would pick up feedwater

systems, and one could also interpret that to mean that you could also pick up power supplies, because you need them to be able to mitigate certain types of events.

We have received a number of comments on that, and I think we do need to deliberate on the significance of those comments. We will probably summarize those comments this afternoon. But to reiterate, the focus really should be the concern of significant aging degradation with equipment important to safety.

MR. VAGINS: Again, I want to reiterate, the key is, as Mr. Thadani has pointed out, what is changing within the new license period. And here we're dealing with aging degradation which, of course, as you know, has a continuing function, and doesn't start at year 41. It starts now and goes on continually.

With that comment, I would like to ask the speakers who have submitted or have requested time to speak. First of all the representative for from NUMARC. Do we have a representative from EPRI? Yes.

MR. SLITER: Good morning. I'm George Sliter, from EPRI. I'm the manager of EPRI. I'm here to comment on the aging and qualification program. I'm also a technical advisor to the NUMARC/NUPLEX Task Group for the cable industry report for life extension of cable. I'll be talking tnis morning about life extention of electrical

systems and components. It's important to point out in starting, because yesterday we heard about mechanical systems and reactor pressure vessels. For electrical systems and components, we have a unique situation, as compared with mechanical systems, for two reasons.

One, aging of electrical components is addressed explicitly in existing regulations and standards. It's addressed explicitly in the equipment qualification rule 10 CFR 50.49. That is the first reason. So age is certainly not a new thing. It's not a new thing in general, but specifically for electrical equipment.

Secondly, the scope of the NRC conceptual rule that you have before you says that it probably will follow the scope of the equipment qualification rule and that is components and equipment important to safety. I think it's very appropriate for the conceptual rule to follow the definition of important to safety that Milt Vagins went over this morning, except that it is my understanding that something like the switch yard outside the bounds of equipment important to safety called out in the rule. The reason is we know that the plant is designed for loss of off-site power, and any failure in the switchyard would be no more challenging to the safety system of a plant anymore then loss of off-site power. So the rule itself would not include, for example, a switchyard in its

important to safety definition.

May I have the the first graph, please? So to continue on this morning's note, we have an EQ rule. It's 10 CFR 50.49. It addresses aging degradation of all significant safety components. Typically when people talk about the rule in equipment qualification, they say it applies only to harsh environment equipment. Indeed, it says that that is the main focus of the 50.49 rule, and that it does not cover mild environment equipment.

I want to make two points there. First of all, regulations, peripheral regulations do address the qualification of mild environment equipment. For example, one place it shows up is in the statements of consideration supporting 10 CFR 50.49, and I quote from those statements of consideration. The commission has concluded that, "The general quality and surveillance requirements applicable to electrical equipment as a result of other Commission regulations, including 10 CFR Part 50, Appendix B, -- see, for example, Regulatory Guide 1.43, Quality Assurance Program Requirements, Revision 3, are sufficient to insure adequate performance of electrical equipment important to safety located in mild environments."

Secondly, of importance to that for mild environments, is the fact that the screening criteria will

definitely be applied to mild environment equipment, looking for significant aging degradation that may impact the long term operation of a plant.

Secondly, the EQ rule covers both old and new plants. Typically we think sometimes that the rule covers only the new plants because the rule does endorse IEEE-323, which does apply and is committed to only by the newer plants, but the rule endorses, as well as the DOR guidelines, and it is important to know that those older plant regulations for the older plants do address aging explicitly. A quote from the DOR guidelines. "Equipment using materials that have been identified as being susceptible to significant degradation due to thermal and radiation aging are included. Component maintenance or replacement schedules should include consideration of the specific aging characteristics of the component materials."

Next, it's important to note that the equipment qualification rule does not limit the component life to 40 years, and it allows the re-evaluation of the qualified life, i.e., if you initially qualified to 20 years, the rule says you can re-evaluate it and maybe qualify it on the basis of operating data or new data for five years.

On the other hand, if qualified for 40 years, you look at the data, the operating environment, and you

qualify it for, let's say, 60 years. So the EQ rule exists and it will be continued for the extended term.

There are generally two types of equipment, short lived components that are replaced periodically on an interval less than 40 years, and for these components, no additional license renewal is required.

Another is long lived components. They will generally require extension of their qualified life or alternatively, be replaced. Of the several equipment types that have a qualified life of 40 years, cable is especially important. It has inherently great significance because it's the lifeline of the plant power control and safety systems in plants, and it is also very expensive and difficult to replace. Therefore, the industry report right now is being prepared for cable in containment.

The remainder of my remarks will mainly give you examples of how long-lived components are being addressed. I'm now turning my attention to ongoing work for the industry report for cable. First, let me go over something that has been talked about at other sessions, but in case someone has come only to this session, let's talk about a general outline of industry reports that are being prepared. This gives you the steps and process to first determine the component systems and structures that

are safety significant. For cables, this would mean that the cable circuits and systems are those that are called out as important to safety in the equipment qualification rule, and you would determine that when you go through your screening process. Next the IR would describe all plausible aging degradation mechanisms, anything that can realistically be thought of as degrading a cable.

Third, you would determine which age related degradations are potentially significant. And by potentially significant we mean degradation that could reasonably be expected to cause common mode failure. It's important in all of this equipment life extension work to recognize that it's not a single failure that we're looking for. Random failures can be demonstrated due to built in redundancy of safety systems. Is it reasonable to expect that they could cause a common mode failure not only during operation of a plant, but also under any harsh environment that it might see in an accident?

Next for those potentially significant age related degradation mechanisms, we need to determine if established inspection, testing or analysis procedures, as currently implemented, bound age related degradation mechanisms within acceptable limits. These acceptable limits for cable are called out by the rule and by associated regulations and standards. In particular for

cable, the acceptable limits are called out in IEEE Standard 383. Lastly, for the significant age related degradation mechanisms that could be beyond the established limits or cannot be shown to be within established limits, utilities would establish degradation management activity for the cable. In my remaining slides, I'll show you some of the options that are under consideration for cable in this area.

Now I'll go through some of the highlights of the emerging industry report on cable in containment. The work is being prepared DOE, and it is being reviewed by the NUMARC/NUPLEX Utilities Task Group for Cable. It's in progress and the target date is June of 1990 for the completion of the IR. The main scope of that IR is cables in containment that are significant to safety. Any mild environment or even harsh environment cables outside containment would be outside the industry report. Again, we can tell which cables are in the scope by using the screening criteria and that is applied in the industry report.

Next, going down the IR process we identify in the report the evaluation basis, the standards of regulation that applied to cables. Those are, again, the qualification requirements of 10 CFR 50.49 and in all qualification documents that call out the maintenance that

one needs to do to maintain a qualified life of equipment, whether it be replacement, refurbishment, inspection, or whatever.

Secondly, it's important to note that the way equipment was qualified was by using a conservative design to estimate temperature and radiation. So there is built-in conservatism that for many long-lived component can be taken advantage of when you go for life extension.

Next, operating experience for cables has been very positive. It turns out that actual environments in the plants are generally substantially milder than those used in the design of the cables. This has come out, for example, in EPRI in a plant aging program which has electrical components including extensive cabling in eight operating plants in the United States, and measurements from that program are showing annually that the environments are significantly milder than those designed for it.

Secondly, cables have shown an extraordinarily high reliability in normal operation, which is no surprise. They're passive, they're designed for really harsh environments, and here they are sitting in a normal operating environment, and it turns out in the Sandia program looking at cables they have looked at the experience record and shown there has been less than one

half age-related cable failures per plant here in operation for the past 20 years of U.S. nuclear plant operation.

When we say failure, and it's something that should be brought out in a number of these sections but really isn't, a lot of people talk about failure rate curves. In many cases, they are nothing more than a thing not meeting some surveillance requirement, it's outside its normal acceptable limits so it's more of a -- it could be as little as slightly out of calibration or not meeting some limit, and it's called a failure and it's plotted. Those are simply the new failures that are of importance when one is trying to protect how reliable and safe a plant is. So let's turn now, going on to the IR for cables.

My next bullet in the next viewgraph lists all of the plausible age related testers that could produce aging in cables. They include temperature and self heaters, i.e., heating in cable radiation, moisture, chemical effects, mechanical effects, stress and strains, abrasions, and electrical degradation. The IR will go through and analyze all of the plausible age related mechanisms, and that work is now underway. The list could be quite long. It includes mechanisms that act on conductors or that act on insulation itself and that act

on the jacket, the entire system, and able system, and installation system. However, when it comes down to which ones are the plausible or perhaps safety or significant degradation mechanism, the three general ones I have here really cover all of the grounds. The first is thermal and radiation embrittlement of insulation, and by that I mean the insulation system which could cause cracking and loss of its function, especially during an accident.

Secondly, and especially for instrumentation cable, a loss of installation resistance of the cable. And third, general categories, mechanical wear that includes things like vibration creep over the hard points when it's hanging over a hard point along its cable tray and mechanicalwear due to handling during maintenance as the plant operates. What will happen now is the IR will look at the plausible ones and identify which of those are potentially significant with respect to common mode failure. That has not been determined yet. So note that there are other plausible, conceivable degradation mechanisms that are listed in the PLEX rule. I think right now the conceptual PLEX rule puts down all the conceivable ones, but we'd like to point out that some of those are simply not plausible for cable in relation to corrosion of the polymeric insulation and chemical effects just are not plausible for cable. So for the component

life evaluation, to establish the bounds, what will be done is a re-analysis of qualified life according to the EQ rule using the original data for the cable, but taking advantage of the conservatisms -- mainly the conservatism in the design of the cable to accommodate environmental conditions.

While you're at it, you also need to address any issues that have been brought up over the years by research. For example, the effects of combined environments acting simultaneous and the cable dose rate and the effects, if any, of those that have shown to be significant, they will be taken into account in this re-analysis.

Secondly, the evaluation and bounds also relate to maintenance that is based on current regulations and standards.

Now we're into the screening process here. We've listed a plausible mechanism and those that are bound to it. It may turn out that some cannot be shown to be within the acceptable bounds for say, a 60-year life and for those managing methods for aging degradation, they will and are being developed for the industry report. Those management options could include such things as environment monitoring, condition monitoring, and inspection reconfiguration, operational changes, and

requalification based on new test data not commissioning test data and replacement.

Environment monitoring is very important especially if you want to take advantage of conservatism for life extension. I'd like to announce that there will be an EPRI workshop on environmental monitoring of equipment this coming year, April 10, 1990, to exchange information on the topic of monitoring environments.

In Condition monitoring there is lot of work going on developing improved methods and if those are useful for life extension, and if they turn out to be practical, they could be used. Inspection would look at such things as located hot spots in the plant and also looking near the ends of cables near a termination because these are areas that are subject to degradation for maintenance handling. So either in your maintenance program itself or additionally as a separate walk-down, you'd want to look at those areas.

Reconfiguration means rerouting cables. If it's in a hot spot, you might want to reroute it. Operational change might be reducing a current in a cable to reduce self-heating.

In conclusion, then, I'd like to state the NUMARC/NUTLEX working group conclusions with regard to electrical systems. It appears that there is no need for

a regulatory guide in lieu of the existing rigorous equipment qualification regulation 10 CFR 50.49, and the guidance that contained in Regulatory Guide 1.8. The outlined conceptual rule seems to be month to month with regard to the use of existing EQ rules. But it needs to reflect more the NRC philosophical positions regarding the credit for ongoing programs, which here are clearly equipment qualification programs, and also the need to address only significant age related degradation, and the screening process developed by the industry will identify those significant age related degradation areas. Thank you.

MR. VAGINS: Are there any questions or discussions on what George has presented? The only comment that I have, of course, is that mice and rats have been known to change the configuration of electrical systems and they're not included in either your studies or mine. Mice are a plausible possibility. Are there any questions?

I think George made a very fine presentation and I think this is one area in the electrical area where we have got to try and the NRC has spent a great deal of effort in the aging programs long before it became fashionable; it is not the only area. I think pressure vessels for the last 25 years have spent time on aging

there, too.

Question?

MR. ROSA: Faust Rosa, NRC. George, at the meeting I attended a couple of years ago in San Francisco, the question of detecting mechanical damage to cables in condos was a pretty heavy topic of discussion. What are the developments in that area, because I think the possibility of widespread mechanical damage may pose quite a problem?

MR. VAGINS: I think that issue was raised in one of the questions. So let's bring up that question.

MR. SLITER: I was going to raise my hand and ask the question, so I'll ask my questions first because it has to do with yours, I think. Then I'll answer question number four. It says most cable has been qualified for 40 years, 100 year life as demonstrated in certain installed applications and conditions, including environment, pressures, cable, electrical loading and cable mechanical loading for which a cable was designed.

Here is my question. Given that manufacturers have provided certain important initial parameters for new cable, what kind of programs should be proposed that could be instituted to establish the in situ condition of a cable and the potential degradation that would take place beyond the current design life? What is the meaning of

importanance of initial parameters?

MR. ROSA: I would attempt to address things like mechanical strengths of the insulation, the jacket, the insulation resistance of new cable, for instance, things of that nature.

MR. SLITER: The answer to your question, Faust, is first and most importantly, that the issue you raised is a new issue. The plants need to have installed their cables according to good practice, and if they are not, it is a new issue. Given faulty installation, it is not plausible or significant that aging would worsen things. If you damage the cable on the way in, that is your main damage. The aging is not going to increase too much over years.

So the important thing to realize is that cables need to be installed properly, and if indeed there is some kind of a problem somewhere in the installation, it more than likely would be taken care of by the single failure thing. It would have to be widespread and rampant abuse of installation practice before you could ever get into a mode in which you're likely to have a failure mode. So, first, it's a new issue. Second, it's covered by redundancy of safety related systems. But let's just tack on here now, outside the scope of life extension that it is indeed an issue for at least one particular plant.

We all know that TVA had that particular problem, and indeed if any plant is having problems in their cable systems, it would be good if we had a condition to monitor or an in situ test technician that could go in and test the cable and tell whether it was okay or not. EPRI is trying to develop some methods.

MR. VAGINS: I do want to make reference to what was said about cable. Today there is a problem that will extend into life extension. I think monitoring programs are significant. NRC has cable monitoring programs that NIST -- I'll never learn to say that correctly -- it was the NBS, and of course George has his programs and we will hopefully come up with some good cable monitoring methods, and they, of course, will then be available to be applied to now, to tomorrow, and the day after.

Are there any more questions or discussions for George's presentation, which I think is a good one? The next speaker scheduled is someone from Northern States Power, Monticello. Anybody here? How about Yankee? Yankee will speak.

MR. MCCOY: Good morning. My name is Bob McCoy. I'm here representing Yankee. I'm a senior electrical engineer there for over five years. The last few of those years I've been on the licensing renewal project. I'm also vice chairman of IEEE Working Group 4, which is

presently writing a guide on the aging assessments of Class 1 equipment, and I'm also helping George with the cable industry record.

The primary function of electrical and I&C systems is to provide power, control, instrumentation to fluid and mechanical systems. The I&C systems are generally composed of similar [illegible] components.

Section XX.9 [illegible] we go through, requ[illegible] requirements, functi[illegible] degradation of mechanisms, and also re[illegible] identify, evaluate, and trend effects of relevant degradation for all equipment important to safety. I stress that it requires it for all equipment.

It's our contention that Section 9's scope is unnecessary. It's recognized that degradation concerns do not exist for many components. This is because of design considerations, benign environmental conditions, inspection, and maintenance programs, refurbishment or replacement programs. The rule needs to consider these factors so that re[illegible] focused on the areas warranting attention.

Section 9 differs in this regard from the NRC's expressed philosophy on page 10 of the proposed rule which

states, "Those structures, systems, and components that are effectively covered by existing ongoing NRC requirements and/or licensee programs, or are not subject to aging mechanisms, need not be addressed in the application."

Now coming back to electrical and I&C components, what causes degradation for electrical and I&C components is temperature and radiation, with also some effect from the operation of the equipment. Many of these components are located in areas with controlled temperature and radiation, and they're in the mild environment. Many of those components are also covered by existing programs which maintain, refurbish, and replace its components. It's these programs that have been proven effective over years of operation, and they are continued to be updated as we learn more.

Some examples are I&C setpoints. We look at instruments and see its setpoints starting to drift. If it drifts too far or too often, we'll refurbish the instrument. Another is battery testing. Periodically we do a performance discharge test or a capacity test. We replace the battery when it reaches 80 percent of its capacity. This is in accordance with the IEEE standards.

Class 1E equipment must meet their safety functions over the installed life of the equipment. This

is accomplished through a program of quality assurance, design, qualification, production, transition, storage, installation, maintenance, surveillance, and periodic testing. Thus the Class 1E equipment is continually maintained, refurbished and replaced. They must meet their safety functions throughout the initial licensing period. With the continuation of these programs, Class 1E equipment can safely be licensed for a licensing term.

Some programs are periodically being replaced. Functional testing, calibration, monitoring the cause of degradation -- and what I mean by that is what George Sliter talked about earlier. Maybe we can monitor the environment if that is the cause of degradation. These programs are continually updated and they improve with time and knowledge. We're learning all the time.

Another example is environmental qualification in accordance with 50.49. This requires that an aging analysis be included to demonstrate the equipment's operability. 50.49 will be applicable during the license extension as well. So this should not be required to be addressed on the application.

In conclusion on these existing programs, I'd like to make it so that the rule should allow flexibility to credit existing programs where they're found to be effective. What we're looking for are those components

that are not uneffective programs. Degradation mechanisms are understood based on years of experience, but the understanding is continuing, especially in environmental and material interactions.

Some examples of the degradation mechanisms we've come to find, are thermal and radiation embrittlement, loss of dielectric strength, and loss to dielectric strengths also means loss of installation resistance. They have different connotations. For most components, analyzation and inspection of actual conditions will help to define the degradation mechanisms. Some will be defined by further evaluations. For example, the cable industry, as George discussed earlier, is under an industry investigation to determine if conservatism in the design and application is adequate to allow continued operation through an extension period or should we apply some additional inspection programs.

Managing degradation mechanisms. Additional programs should only be a requirement for equipment important to safety. No additional programs should be required for those covered under existing programs -- existing and effective programs. For example, the EQ rule should allow flexibility to credit these programs.

Several methods that can be viewed for managing degradation. One is further analysis which can show that

the degradation is acceptable. Another is a current program that can assure that the degradation results in no safety impact. We urge that procedures may have to be enhanced in some cases and that is another method of managing degradation. For example, we can use some trending. We can change operating practices if the degradation is based on the operation of the equipment, or we can replace and refurbish it even periodically or based on some indication.

I touched on trending on the last slide. But trending should not be applied unilaterally to all equipment. Some examples where existing programs suffice -- if we replace the equipment before it degrades, for example, setpoint drift; or if there is existing programs that periodically refurbishes the components we need not trend; or third by operating so that degradation is not a concern. For example, the number of systems for the environmental conditions.

The point I'm trying to make is we should efficiently apply trending only where meaningful and justified. Administrative controls should be implemented to those specifications that are required to manage degradation. These can be maintained as licensed components.

I'd like to bring us back to Section 9 of the

proposed rule. Section 9 should be a screening process. The screening process should be based upon important to safety not covered under existing programs and subject to significant degradation. Thank you.

MR. VAGINS: I think Mr. McCoy's presentation, again, reflects Yankee's continuing and ongoing valued efforts which, along with Monticello and Northern States Power, represent real efforts. Are there any questions or any statements concerning Mr. McCoy's presentation, which I thought was very thorough?

MR. ROSA: Faust Rosa. I have sort of a hang up with cables in containment. I don't understand how an ongoing equipment qualification program on cables in containment can be used to the extent of the qualification of those cables?

MR. SLITER: I think, Faust, the problem you may have is not understanding the total concept and approach that the industry has used to qualify cable. I suggest you look in IEEE-323, not that it applies to all plants, but the concepts do. Qualification is not only a test in the local chamber. It goes way beyond that. In the introduction to 323 it says, "Qualification is based not only on testing, but on a good design installation, maintenance, QA, the whole smear that is qualified cable. And there is no question in anyone's mind that if someone

does a poor job in any one of those areas, they may violate the qualified status of cable. It's advisable not to violate any one of those. What is it you don't understand?

MR. ROSA: I guess it's the fact that the proving element in the qualification programs for cable or any other equipment is a test. And we have performed tests on these cables in the local environment, and now it appears that the direction that you're taking seems to point to -- let's use those test results and the consideration of all of those elements you just mentioned and extend the qualification of that cable for some period of time. I don't know how effective that is going to be, and that is my problem?

MR. SLITER: When we reinterpret test data -- when I say that, I mean reanalyze it. We're talking about a measured environment which is valid, and we are also being very careful to address any significant aging issues that have been brought up by research over the years. Those items are the places where there could be substantial differences in one answer over what we got originally. We'll address both of those. But my main answer goes back to what you brought up. You said you don't understand how that single test tells you everything. My only response is the one I said a moment

ago, that it is not the only way we can qualify cable. Qualification includes all of the good features I talked about, done according to industry practice, and one of them is cable installation and it needs to be done properly. So I think a cable test is just one element of a good qualification program.

MR. GARDNER: J.B. Gardner, consultant. I was going to add another word of clarification that might help. Test qualification, EQ procedures consists of two things. We make a device look old, 40 years, and then we test it. Now when you make a device look old, you go through some routine of pre-aging, which you think is good for 40 years under certain assumed conditions. It's good for 100 years under different assumed conditions, or 20 years under other assumed conditions. That is all in equivalence So what George is talking about, okay, we did it for 40 years, we think, sometime ago. But we get new data now and we say that wasn't 40, we really tested it for 80. So that is the concept of how you extend a qualification. I like to call it qualification extension, not requalification, because requalification brings to mind doing the whole smear and testing, including everything else. But the extension simply means you use a test as it was, but you use the condition as it is now revealed rather than as it was assumed. That permits you

to have a different requalification for productive years of successful operation.

I'd like to comment on one thing, George. In addressing this question of using prequalification data, as you realize, the plants have been qualified and are under three different sections. The older plants were permitted to qualify without pre-aging, and I think therein lies a good question as to how you demonstrate a cable which was never pre-aged as part of the qualification test. They can now be proven to be suitable, especially most of those old cables that are not even made today and are not available.

MR. SLITER: I agree with you, and that is one of the main things we need to look at in the industry report and that is being examined, of course. On what basis do you make the judgment that you have demonstrated that you do not have a cable that has aging effects that could give you a problem?

MR. BLOCH: Peter Bloch from NRC. I wanted to ask if I understand correctly that something is not significant to safety if it would bring down the redundant piece of equipment, but does not cause a common mode failure? Maybe you can comment a little more?

MR. SLITER: There are certain types of degradation, some that could be expected to cause common

mode failures. For example, if two redundant systems both went through the same compartment that was not found to be too hot, they would both degrade, crack, and there could be a common mode problem in that.

Another example of common mode would be, of course, the accident environment, which is directly addressed, and you just go through degradation mechanism after degradation mechanism and ask yourself is it reasonable to assume that you could have 26 of these affecting redundant safety training? If the answer is yes, then it needs to be addressed in a qualification program.

The early founders of nuclear plants, in their approach to qualification, realized there was no way that they could assure that there would be no failures of safety related equipment. We depend on defense and redundancy. An example of this would be maintenance errors. If someone is putting back a piece of equipment and he gouges off cable, the accident comes along and he fails a piece of equipment. He did it the same day and that same guy -- it's not reasonable to suspect he would have done damage to the other system. That is known as random failure. If a failure is easily detectable, you see, you can fix it.

MR. BLOCH: Can you have failure which doesn't

cause common mode failure?

MR. SLITER: Sure.

MR. BLOCK: Are those safety significant?

MR. SLITER: No, because you have a redundant system.

MR. BLOCH: You say it takes down the margin of safety for the operation of a plant?

MR. SLITER: It takes down the margin of safety. It's not a question of taking down the margin of safety. It's a question of whether the margin of safety is acceptable in the way the plant was designed with its redundant system, whether it was to insure an acceptable margin of safety. It's taking advantage. You're just looking at it from another point of view. You are taking advantage of the margin of safety. You don't operate your plant after an accident. You should shut down and repair everything that has been going wrong.

MR. THADANI: George, I had a similar question. It's still not clear to me what you really mean by the fact that a plant is designed to be able to take a single failure?

MR. SLITER: Yes. The plant was designed for that, and the very reason it's designed to be able to take single failure is -- it's not like I'm going to have a single failure. It's not likely that that would happen.

But if that were to happen, I have back up. The question is are you suggesting it's okay to change the likelihood of initial failure, single failure, and if you change the likelihood of the failure in a significant way, then you have, in fact, reduced the margin of safety.

The next question is how significant is it? It's not clear to me how you interpret that or what is your level of threshhold.

MR. SIMMSAC: Bill Simmsac. Yes, having been involved with the putting together of NUMARC, it was never intended to screen criteria upon equipment. Redundancy is not a reason for disposing of it. Just because you have one train versus another doesn't mean you can get rid of both trains. The criteria is meant to be applied in the following manner:

If you have any system to perform that function, then if that equipment is important enough to be looked at with regard to license renewal, it was never the intention to use redundancy as an argument for screening out equipment.

MR. VAGINS: Whether it's redundant or whether it's only a single occurrence failure, if it is age related, it will be covered by the rule. There is no such thing as a nonsignificant, age related failure, because it is an indication of the existing age. There must be

something aging somewhere else. To define a single component age is extremely unlikely. You're going to find similarities. The program has to cover all failures.

I hope that clarifies the issue. I don't think it meant anybody is going to stop and say we don't care if it fails because this is backup. We don't want any possible failure.

MR. SIMMSAC: Earlier we began a section -- you had a slide up there that showed a main generator and control switch area being --

MR. VAGINS: No, I said we'd like to have your opinion, but we'd like to have your thoughts and what they should be.

MR. SIMMSAC: If you considered them, is it only to the extent that the equipment ensures proper isolation? For example, on the electrical side you make sure your station service system is effectively isolated from a grid in case of a problem, so you don't bring down the greenhouse system?

MR. VAGINS: Yes. I personally desire that we go further, but I think what the NRC is proposing is if those systems fail or interfere with our safety system or prevent a system --

MR. SIMMSAC: So with regard to the switchyard in Yankee's case, our transformers are separate from the

switchyard, but the isolation is still with transformers and switchyard, and the screening is not, but station service transformers and their isolation equipment are. So that philosophy is what we're using. If we do it that is great.

MR. VAGINS: It also stands to reason if we determine indeed transformers out there are aging, you're going to look at them. If your switchyards go down, you don't want loss of off-site power. I assume you're going to do something about it.

MR. MR. SIMMSAC: We're looking at it up to the extent that the controls effectively produce a reactor trip and isolate a steam system properly. It's an economic conversation. So, I guess based upon this interchange, the interpretation in the phrase in Section 3C-1, where you can make a definition to prevent or mitigate a consequences, this is the flavor in which you mean that phrase to be used.

MR. VAGINS: If you sat in on the screening section yesterday, you would know that there was some discussion about broadening it to this year.

MR. MR. SIMMSAC: That is where I want to make the clear distinction between an initiator that could have ramifications in the safety of the system, or rather things just being a pure initiator that some equipment

brings the plant down.

MR. THADANI: I think you make a valid point. You used a good example. You may have hundreds of different ways you can trip the turbine, and it might not be reasonable to, let's say, dig into each one of those ways that the turbine can be tripped. And let's control all of that, because if you really have a significant problem, you ought to see it pretty quickly, I would think.

On the other hand, I think as you noted, the trip is a very important function and can help mitigate certain types of events. We ought to focus on that function. I agree with you, a difficulty comes in. But there may be some other areas where certain initiators may be important and those systems may not be classified in the classical exception as mitigated systems. What do we do with those?

I think the conversation, particularly yesterday, that we had was certainly helpful to me, and I think it will force us to look back through that issue a little more carefully. As you see, we're doing a lot of soul searching and we want as much input as possible. We re not looking at it too closely from the age viewpoint because the challenges are not severe.

But again, we're not looking at them. Therefore, the question now becomes strictly one of license renewal.

We're not looking at them. Are they aging and can they cause more challenges than we'd like? That is one way of looking at that. The other way is maybe challenges will increase, but they aren't significant. This is the kind of input we need from you guys from outside.

MR. NEIL: Karl Neil, NRC. On the switchyard, I'd like to make one comment. In loss of off-site power, the reliability of the switchyard has to be maintained from the aging standard for a renewal period. My question relates to has there been a number?

We've heard it often enough here in the last two days, the philosophy and the conceptual rule with respect to the scope of what is required. In other words, the philosophy says we'll give credit for ongoing programs. The most recent speaker from Yankee pointed out that he would like credit for ongoing programs, ongoing effective maintenance procedures, things likes that. In terms of ongoing programs that the NRC administers, we know what they are. I don't think we're going to have much difficulty giving them appropriate credit in the rule and addressing that. But in terms of licensee programs, I see some difficulty in how do we incorporate it in the rule provision so that licensees can take credit for their individual programs? My question is what are the suggestions with respect to specifically, how do we do

this in the rule? How would you suggest we write the rule so that licensee programs can be given credit for?

MR. VAGINS: I think the question was pretty clearly presented. Does anybody have an answer to it?

MR. DAY: Mannie Day, NRC. I had a question along the same lines. How many of these programs that you have mentioned are tied to industry standards? Or are they just programs that exist at Yankee?

MR. MCCOY: Where there is industry criteria for programs, that criteria is utilized, as I mentioned, in battery testing and things like that. But a lot of the programs are based on our own experience and feedback we get, such as circulars and notices that we factor into our maintenance programs.

MR NEIL: Karl Neil, NRC. I think that was exactly what I had in mind. If there are some standards that we could refer to, then we could list those in the consideration and include them in the rule somehow. I think that would be an easy way of handling it. But if you're talking about a specific plant procedure in individual plants that are all different, it's going to be more difficult. I think if you want credit for those, you're going to have to address them in some kind of way in the rule, and I don't see my way clear to doing that at the moment. If I sat down and wrote that part of the rule

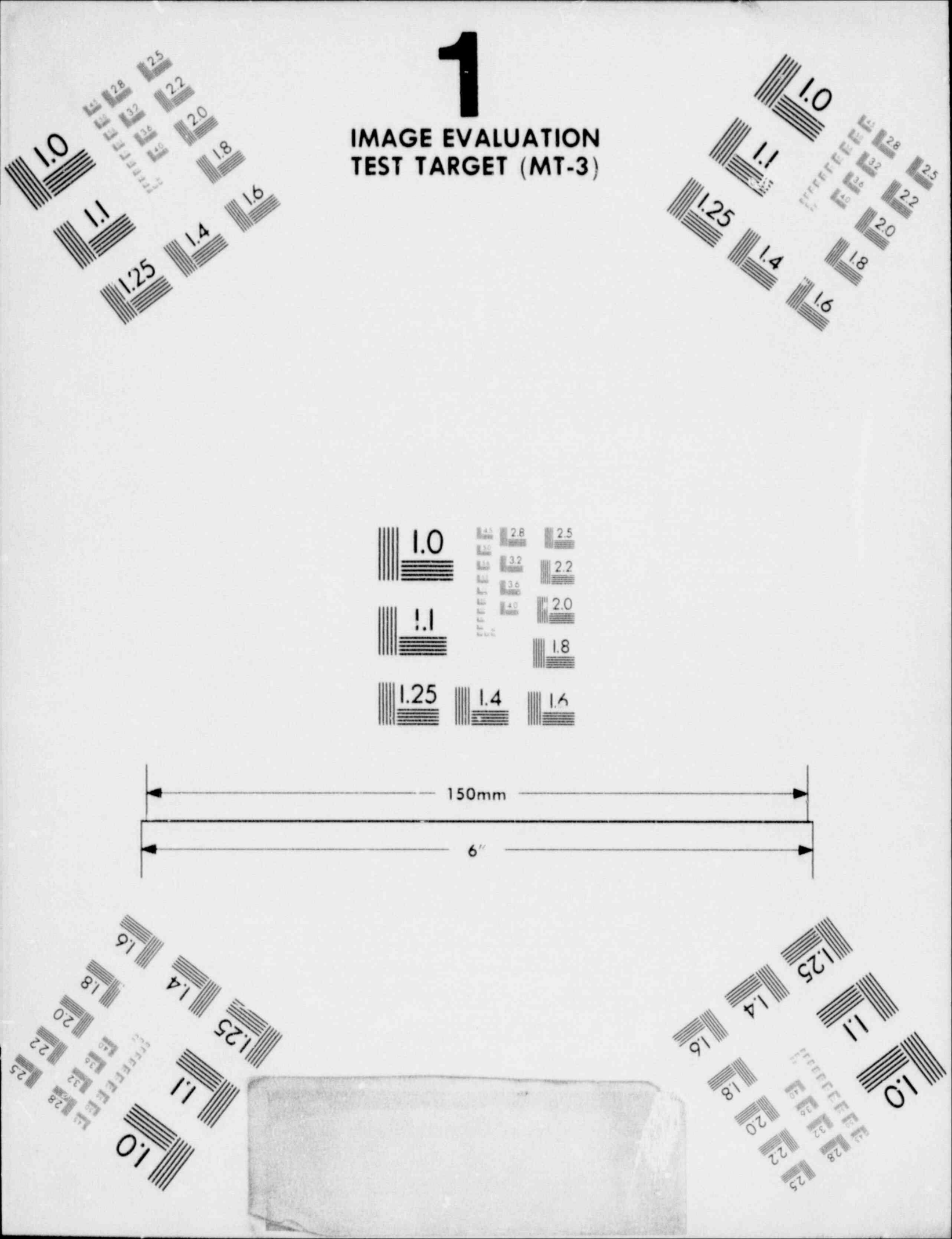
right now, it wouldn't flow easily.

MR. VAGINS: I don't see any simple way to handle that. It would have to be, since each plant would be different. We keep addressing and discussing the uniqueness of our plants. But I don't see any way to submit a program for approval by the NRC as part of their relicensing basis.

MR. ROSA: Faust Rosa, again, NRC. I might offer a suggestion to the industry. There is a pretty strong economic incentive to keeping a plant operating. Failures like main transformer failures, unit transformer failures, switchyard failures, these all impact the operability of a plant from an economic standpoint. The rule might address the level of operability of a plant as a measure of the programs within the plant for keeping these things in a reliable condition.

MR. VAGINS: That is something of course that the agency has been playing around with for a long time. But, again, we want to make sure we don't infringe on the NRC's function, safety. It is their interest, yes. A really safe plant doesn't do anything. It's very safe. It's there.

MR. HINGLE: Bill Hingle from Yankee. I'd like to comment just a moment on the use of existing programs. I think Karl Neil was questioning that. I think in some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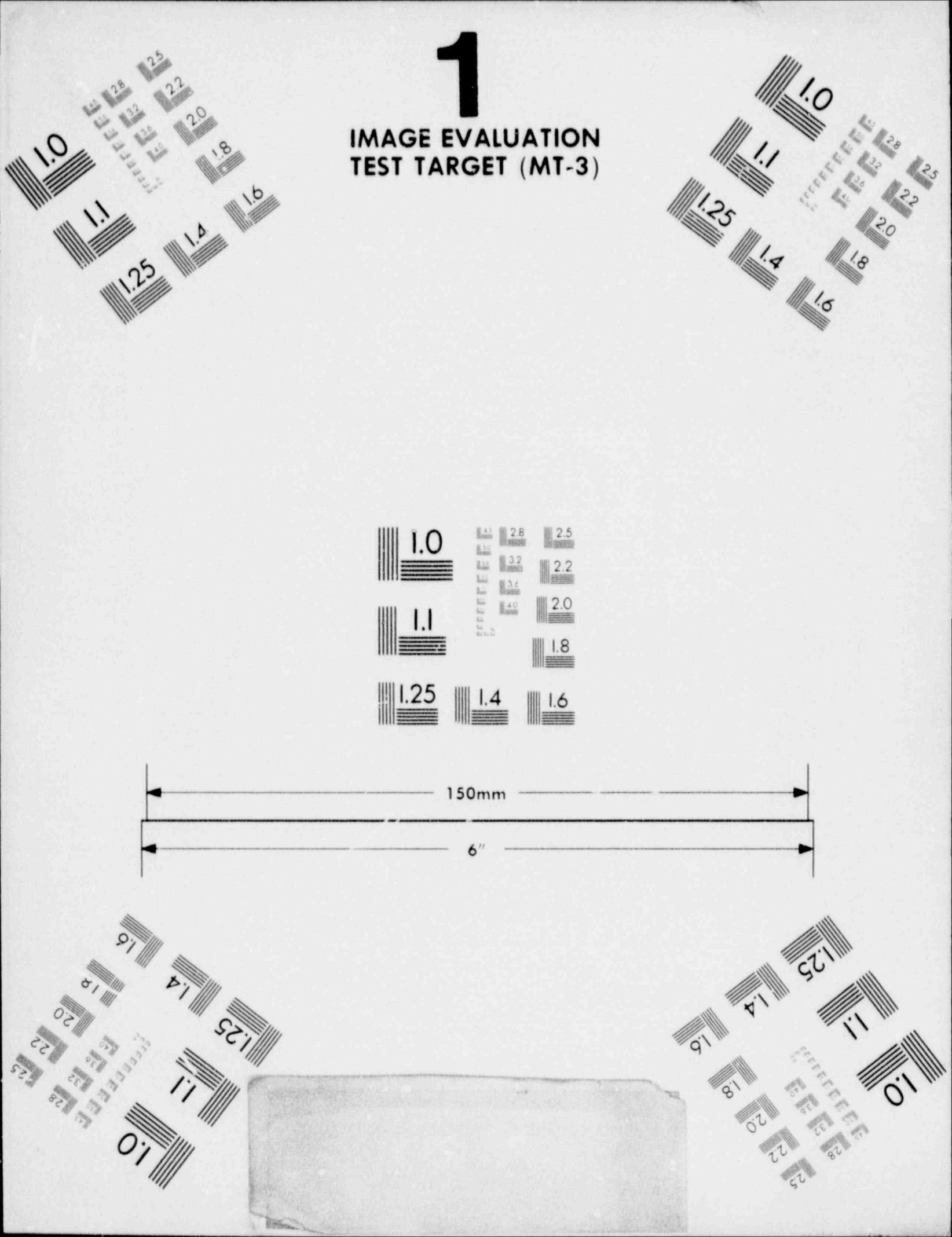
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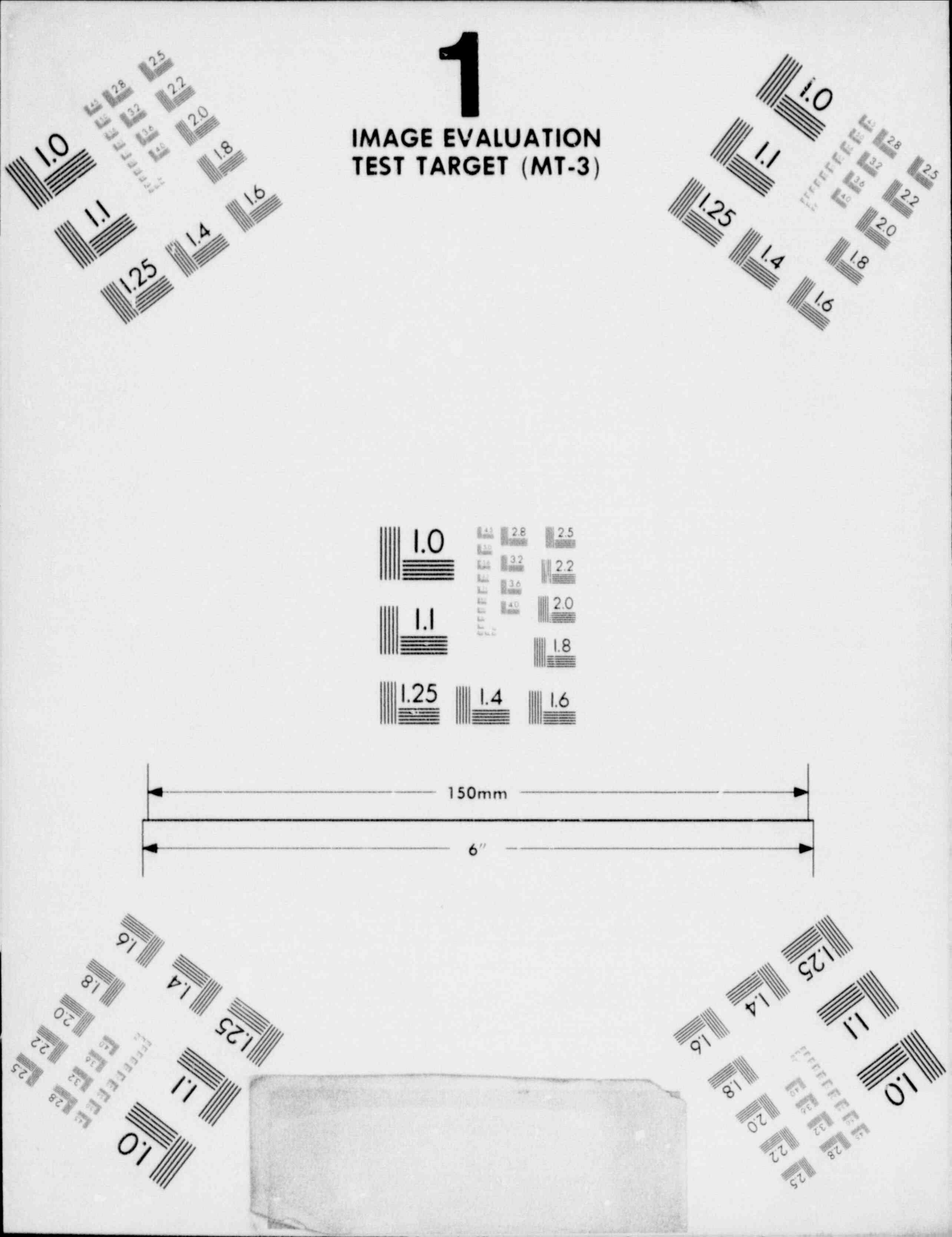
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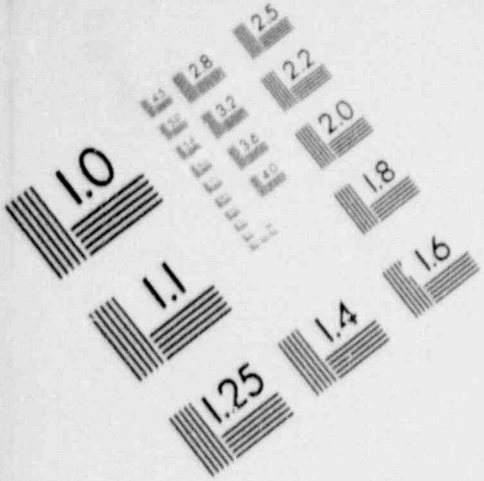

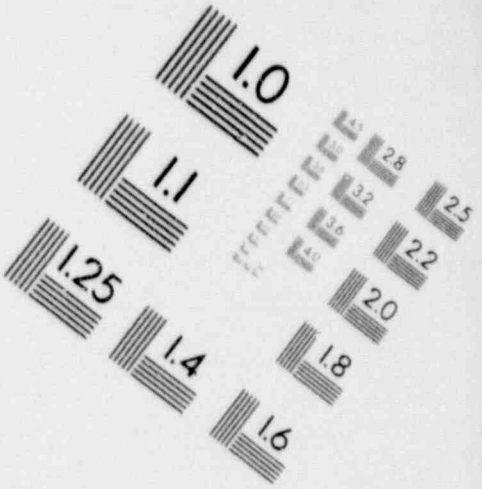

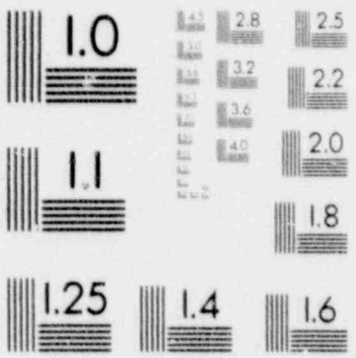

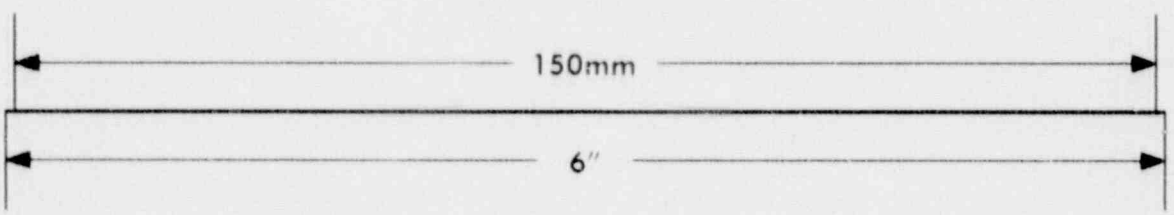

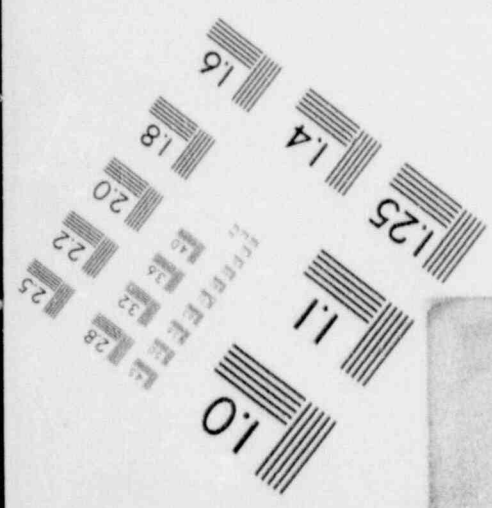

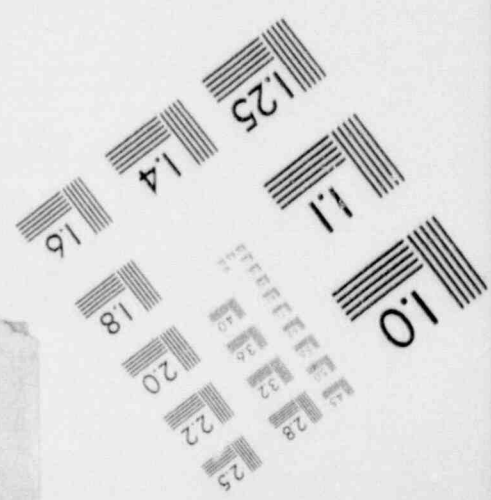

cases you can credit programs which meet specific criteria and that has been proposed in screening methods, to apply those criteria to the evaluating of programs we think we have in place to cover certain pieces of equipment. Those run something like this: The programs document, approve, and routinely implement in accordance with those procedures. If a program assures all components of significant safety functions, or aging is addressed, and if the programs establish the acceptance criteria and requirement for follow-up action.

So what you could do is establish criteria that have to be met that wouldn't be produced in a document. All the information is on the application. We would propose that we would have that documentation. In other words, we have to begin through satisfying ourselves that we meet those bases, and that could be audited. It seems to me that you could write it in your rule like that and it would be audited.

MR. THADANI: Let me, for the record, at least, say that industry's responsibility is more clearly safety as well, and the second part of NRC's responsibility is safety, yes, indeed. But after a certain level of safety, we do have to take that into account. So I think it's a little bit more than what we stated earlier. We can't just go beyond our basic level of safety without proper

consideration to cost.

MR. VAGINS: I want to reiterate what I said, and that is that in no way did I intend to say we're not interested in operability. I said how to measure, how to interpret operability, again, from the viewpoint of safety. Obviously, the prime responsibility for safety lies with the owners and utilities, not with the NRC. So obviously, you guys are concerned with safety, too. There is no such thing as a utility not concerned with safety.

I'm just kind of curious -- as things go on, people talked about monitoring methods. How many utilities out there right now use thermographic inspections of control centers, you know, control centers, circuit breakers, et cetera? Yankee went up. Are there any other utilities here? That is kind of interesting.

I suggest that maybe utilities ought to think about that. For instance, having plants have phenolic boards. You talked about mild environments. I have a couple of electrical radios that go back 30 years and other things that are sitting in my house which seem to be in a mild environment, particularly if you don't have children. Phenolic boards, I wonder how many people are looking at them. It's been a very good exchange, and I would like to keep going. Are there any other comments? Mr. Aggarwal has some comments he would like to make.

MR. THADANI: I recommend we take a break and come back. Let's make sure the focus of this session is clear to everybody. I'm not looking for any input from you on the issue of source term. Whether we're going to change a source term for license renewal purposes or not is a separate matter. You're certainly free to make comments, but recognize that I'm not looking for feedback on that issue. Other than that, why don't we take a break. I know there is lot of interest, but let's take a break for a few minutes. We'll hear from you soon.

(Short recess.)

MR. THADANI: Satish raised some stimulating questions, and I know there were a lot of people anxious to respond to those questions. George, you wanted to start out?

MR. SLITER: Satish, one of the main responses I've heard over and over -- I won't dwell on it -- is that almost all the issues you raised in your comments have to do with now issues and they should be handled in the now environment and not in the plant life extension. I must point out that what was in your conversation, I felt was addressed in my presentation, describing how the industry addresses mild environment equipment, balance of plant equipment, important to safety, et cetera. I think you should rest assured that the industry approach to life

extension of electrical equipment has come up with a screening process which should be assurance to you from that for life extension at that mild environment equipment and equipment that is important.

The safety in a plant will be looked at, again, with respect to identifying significant aging mechanisms and assuring ourselves and the regulator that they have been adequately handled. So it's indeed another opportunity for the NRC to make judgments on adequacy for those programs for life extension.

MR. VAGINS: Any others? We have one more scheduled speaker, Mr. Gardner.

MR. GARDNER: I'm J.B. Gardner, consultant. I have been involved in cables for some 40 years and on nuclear application of them for about 20 of that; on the manufacturing side the last 9 years as a consultant. All of my remarks are cable oriented. I'm going to try to hit points that may have been overlooked or sidestepped by previous speakers.

Age related degradation, aging effects, as I'd like to call it, are the name of the game and relative to the rule that is being considered. There are a number of mechanisms that are described there and I would like to suggest that it might be good to name the mechanisms in the rule, simply to get the NRC and the utility industry

talking or addressing the same terms so that new worms don't get picked out of the can unexpectedly when people go for extensions. But if they're enumerated, they should be segmented into those that are pertinent to different sorts of materials. I think it is very different from those important organics which may be very different from those that are pertinent to electronics. I think just to put down the shopping list pretending that they all pertain the same thing to all would be very misleading.

That brings us now into -- oh, there is an omission to that which certainly is pertinent to cables and to other things, too, because I see 100 percent humidity in number specifications for plants, and I believe that moisture, as George pointed out, is very definitely an age-related mechanism of failure which has not been addressed and should be in the industry both now and later.

Common cause failures is the driving agency for qualification. This is noted in both 323 and in 189. So I think that is the thing that we should all keep in mind. That is the name of the game in terms of prime effects on safety. You can't talk about common cause failures without thinking about what is the failure mode that we're looking for in the common cause. That is a wild English expression in gra r. But anyway, I think the point

should be clear. We should be thinking of common cause failures. To do that, you have to think in failure modes. To do that properly in the case of cables, we have, both now and in the future, a problem that it isn't really cables, but cable systems which connect all of these active elements in our plants together. The industry is way short, and I say the industry, IEEE for instance, in addressing all the connections, interfaces of many kinds, which are necessary for the cable system to work.

Again, this is both a new and a future issue. Whether you want to then disclaim the thing as being a concern of extension, I'll mention that a little later.

I have a real concern because there are many open issues in qualification of cables. These have been very well pointed out in some Sandia research and reporting. Some of those have also been reported recently in the IEEE studies, and the work that is going on both point out the open issues, as well as point out how some of them can be addressed. I think that is a very constructive way to go.

Again, it's sloping over between now and future concern. But the question I have with much of the work is that not only is it just focusing on cables, but there has been a lack of operational requirements being realistically described. Going back in history, the operational requirements that were put in the

specifications to cables suppliers were grossly inadequate in light of present day technology in knowing what the systems require. And this is the case again.

One could consider it a new issue, but certainly if we are going to delve into new technology, new signs to free research to help solve the problems, the question comes to mind, if we use new research, do we use the other products and research? Say to yourselves we need to address all of the aspects that research turns up, not just the goodies that will help us follow through.

That is an ethical side of what Mr. Aggarwal was saying. If we use some benefits, do we also have the obligation to use all of what the research is turning up in the light of life extension? I think the bottom line then of what I'm trying to bring to light is that EQ extension is the name of the game for the cables, and much of the electrical system follows along the lines that George Sliter pointed out so well. This focus is on common cause failures. It gets into the system and all of the modes of failures which a common cause might inflict.

Turning now to the rule, I've mentioned already the degradation mechanisms being mentioned therein and that they should be segregated. The other is that I think the rule would be very helpful if you mentioned in it something about relation of equipment qualification,

because in the electrical system, this is the name of the game. I see very little, if any, mention in the rule to this key element. For the moment, I think that will conclude my remarks. Thank you.

MR. VAGINS: Is there anybody who would like to comment on that? My general comment, of course, is that emphatically, no, we are not going to ignore the negatives and emphasize the positives. That is just not in the game, and NRC will not do that. But as I mentioned to you privately and as I'd like to tell the audience, in some sense, negatives are tomorrow's positives.

What do I mean by that? We have a system now which is in place. It says you're good for 40 years. I'm not going to say whether it's correct or not. That is another issue. Right now it's in place. If you want to use a positive to expand it, you have to prove your case. If we find a negative to challenge today's rules, we're going to change it today. We have to find it. We have to prove it. We have to make sure it's true. Rest assured that is our mission in life.

One of the biggest missions of the NRC -- and by the way, the mission of the Office of Research that was put into statutory words in the Organization Act of 1974 is that the Office of Research will do confirmatory research. So one of our biggest missions in life is to

say these are the rules in hand. Are they any good? Prove it. Unless we get completely out of the budget, can you tell us -- which Gramm-Rudman is doing to us today -- we would like to solve the problems and we are going to within whatever possibilities of funds we have. But I just want to emphasize that again. No, we're not going to ignore the negatives. It is our job to look at the negatives and to make sure they do not impact safety. It's the responsibilities of plants and the owners. It's their first responsibility, and they are primarily responsible for safety.

So I think that is true. As far as how slow we move, well, sometimes it's hard to prove and sometimes it takes a long while to do it. But I think we have a track record of eventually doing it. If we can find something which needs immediate safety action or immediate safety concern, we will act immediately. That doesn't mean shutting down plants, by the way. Sometimes we can handle the problems in other ways, as we did with the pressurized thermalshock issue.

Are there any more comments to either Mr. Gardner's comments or Mr. Aggarwal's comments?

MR. FARMER: Farmer, NRC. As you're well aware, Sandia performed the detailed assessments of the source terms using all the latest mechanistic calculational

methods, and the results came out showing that dose equipment inside containment is essentially consistent with those in the old TID. That is happenstance, but that is the way it came out. So based on that, at least this time there really is no basis of changing the rules. If there was any change, it might be that we look at severe accidents and doses are ten times higher than what they qualify for.

MR. VAGINS: Severe accidents is another issue, and the Commission says that it will be closed before license renewal. Of course, it doesn't remove the concern that Mr. Aggarwal brought up of Category 1 on plants. If we have plants -- if plants have done the equivalency study, I think we do have a problem. I think Yankee knows that. We're waiting to see what they do with the extension of these plants.

Again, one of the areas most of us deal with regularly has a great deal to do with debt. And the professional societies and the IEEE are very active in looking at aging degradation maintenance methods, et cetera. I would only encourage them to continue. We would love to have a system where we could sit back and endorse industry standards. That would make it the simplest thing in the world. So with the professional societies and IEEE, we're able to move to the issue in

time. That would be one way of addressing it. But it's pretty obvious that they're not going to be able to be exceptionally timely in the next two years.

MR. GARDNER: In line with your last comment, working group 3.46, EPRI is indeed rushing through some guidelines which I hope will contribute to the general question of plant life extension. So we hope that it is of some help to try, of course. There are many people in this room that are contributing to that. I might add that my observation, unfortunately, is that the rest of the IEEE community is not very active in addressing qualification issues. That is the way it seems to be right now, today.

MR. VAGINS: To some extent it boils down to whose objection is being barred and who is going to support whom and who is going to what meetings. And in an era of cutbacks and fund restrictions, unfortunately we get impacted in professional societies. But anyway, it still stands as a fact that if we had standards to cover everything, we would use them. We have in the past and we will continue to use them. Are there any other questions or comments? Any other speakers?

MR. BLOCH: I want to speak briefly. Peter Block. I have been a judge on the Licensing Board Panel since 1981. I have worked with experts at my side as we

judge cases involving licensing of nuclear power plants. My concern in being here is to think ahead to the time when there will be an application before me and my fellow judges, and I want to speak on trending. I want to speak on it because of the Comanche Peak Nuclear Power Plant case where the intervenors came in and proved the records of the plant were not being trended. Appendix B to Part 50 currently requires that you trend the nonconformances that you find in plants. It's a requirement that you must learn what is happening in your plant and learn from it. I can't think of any more important a requirement to keep a plant safe than to find out what is going wrong and to learn why it is going wrong.

Even though it's a new issue, it's obviously of extreme, great importance when it comes to plant life extension, because whatever is going wrong as a plant ages can go wrong in a different way and in an increasing way.

If you trend, you'll see those components that are failing more frequently and you'll know what the problem is. The records will allow you to see what the problem is. Now whether or not trending becomes a part of the plant life extension rule, there is a possibility that it could become an issue in the plant life extension case because it's relevant to plant life extension and because it's already part of the regulations.

Just encourage people to consider the importance of good plant records and good analysis of records for trending for licensing cases and for the safety of the plant itself. I'm disturbed that in speaking to people, I have learned from the experts who know, that Appendix B is hardly known to exist in the community and it's not being enforced. Nonconformances are not being carefully trended in many plants, and in other areas as well. It's not an easy thing to have a good system that allows you to do that, but my understanding is many plants don't do that. Thank you.

MR. VAGINS: That is an interesting statement. George, would you like to make a comment?

MR. SLITER: I'd just like to point out something that goes beyond that. We have to be careful of our terminology. I fully agree with all of the good words you said, and a rule, when it's written, needs to clarify if it mentions trending. You've heard arguments as to why it may not specifically have to be called out: one, because it's in Appendix B; two, because Yankee has made the point that it could be only one element of an entire program. It's probably more important for long term things.

The problem here is one of terminology, and there are two types of trending. There is a trending of the actual degradation of a mechanism as time goes on, and

sometimes we use the word conditioning monitoring. Note the result in the record and that is called trending.

The other one I think is mainly the one you talked about. It's trending of failures. It's important that whatever decision is made that we clarify what we mean. The rule right now -- let's take a look at it. It says, "A description in technical basis for a program of identifying and evaluating trending of the effects of all that relevant degradation mechanisms need to be."

What are the effects of failure or the actual degradation? Technically I think you can make an argument that for many types of equipment, it is not necessary. Practically it does not make technical sense to trend the aging of it. For example, for a relay or pressure transmitter that has a three to five year life, you trend it over six months. I think you're pretty sure that aging is well controlled because of your replacement. However, if the transmitter starts failing, Appendix B is correct in saying you should be trending failures because you have a problem, whether it be in design or not. It doesn't matter what kind of problem it is. So the distinction should be made.

MR. VAGINS: Let me clarify one thing. The staff was very heavily thinking in this issue of trending performance. One issue we dealt with, particularly in

aging programs, was that when failures occur, in some items they occur catastrophically. Whereas trending can pick up a performance diminishing and we could note it. For instance, if we could trend if we run ISTs and we trend the performance of the valves, the increase of thrust requirements increase friction. These are items that we're talking about in aging mechanisms. We're not talking about failure trending. A failure is not acceptable, period.

Therefore, how do we know how close we are in some instances, and trending might be able to give us that information. Areas where things can change. In other words, one thing we don't have is a performance right now. We don't have a performance level. We are either functional or not functional. Many times we do have it in some instrumentation, but basically for valves, for mechanical equipment, and electrical equipment. What is the proper functionality? Is it only when it works or should we stop and replace it at a certain point before it breaks.

Failure trending is not going to tell you that. It will tell you what the replacement or refurbishing period is, but it won't give you the overall picture from an aging viewpoint. That you can get from performance training. The staff is continually looking at this. We

want to try to prevent any kind of failure, within significant failures. We're not going to worry about light bulbs.

MR. GARDNER: J.B. Gardner. Just reinforcing a comment I think George Sliter made earlier and relevant to trending, getting to root causes is a very important part of that. The NPRD is what I have been looking at in the course of several projects that have been very unsatifactory from the point of view of what I believe and what a number of other associated people believe about failures to wrong equipment. Trending in that area can be your enemy, not your friend at all, unless root causes are really carefully discovered from the diagnosis of failures. Particularly in the cable areas where you have these in phases. They can be the culprit.

MR. VAGINS: Of course we're all aware of weeknesses in -- you looked at the cause factors. They are difficult to determine and I'm positive that I've been told that they are trying to correct that to improve the failure of the cause basis. A better identification of that is again today's problem. We know that. It will affect the future, obviously, but it affects us right now. So we're aware of that.

MR. NEIL: Karl Neil, NRC. The question is on trending. I made note of it. It has been mentioned in

several sessions. I've been in that industry and didn't want to trend items where they're going to replace or refurbish. I think George just implied that also. I guess I didn't quite understand why he didn't want to trend failures in things that you normally replenish or refurbish because it would seem to me that if you replenish or refurbish it, you're verifying and using the right life of the component. It might be different in different locations and different applications and different service conditions. So I never could quite -- I made a mental note of that, and I'd like to hear a justification for that.

MR. SLITER: I think you misheard me. I specifically said I agree it makes more sense to trend the failures of the short life component. But it makes much less sense to trend its parameter degradation as a function of time for a long life component. Long life components have a tendency -- you don't want to wait for failure to occur, you want to look at their condition as time goes on. For short term components, it doesn't make sense to trend them. But it may make sense to trend failures.

MR. VAGINS: Are there any other comments or anybody wishes to make a statement?

MR. ROSA: Faust Rosa. I noted that earlier on

the term here and now issue as opposed to a license extension issue was mentioned. Drawing on my experience with implementation, I just want to bring to everyone's attention the fact that appears to be an area where there is likely to be some controversy in the application of any license extension rule. I urge both the NRC people who work on the framing of that rule and the industry people who are commenting on it to focus on making a clear distinction between the here and now issues, as opposed to license extension issues.

MR. VAGINS: I'm a little confused, Faust. What specifically are you referring to for license renewal, as far as the station blackout rule?

MR. ROSA: We've had problems with implementing the station blackout rule because the rule and its guidance has not been as clear as it could have been in some areas. I think this area of making a distinction of here and now issues and life extension issues is of importance in that respect.

MR. THADANI: I think, Faust, you're right. On the basis of just the comments that we've heard today, it's fairly clear to me that we need to focus our attention on this issue and try to clarify what is meant by today's issues versus future issues. I think that is an important point. I agree with you. The example you

use in terms of station blackout is also a good example. That says the industry and NRC, I think, work very hard up front to try to develop guidance for the industry and for individual utilities to follow. This guidance and direction would show that they were meeting the station blackout rule. What some of the audits have indicated is that there might still be some misunderstanding about the intent or what was meant by a license that was put together about the NUMARC and NRC and that underscores the need for us to be very carefully up front and not to have these issues coming up and making those ad hoc decisions later on. So in that sense, I think you're exactly right. It's an issue we must focus our attention on because there is enough confusion.

MR. VAGINS: Are there any other comments or questions? I found the session very stimulating and interesting. But if we're at the end of it, we're at the end of it. Thank you.

(Whereupon, at 11:00 o'clock a.m. the hearing was concluded.)

REPORTER'S CERTIFICATE

This is to certify that the attached proceedings before the United States Nuclear Regulatory Commission

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OPERATING EXPERIENCE AND AGING-SEISMIC ASSESSMENT OF BATTERY CHARGERS AND INVERTERS

W.E. Gunther, M. Subudhi, and J.H. Taylor

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- An inverter manufacturer's representative stated that an inverter capacitor failure occurring at one station was caused by the excessive ripple voltage from the battery charger supplying the dc bus, coupled with the length of time the capacitor was in service. As a precautionary measure, all capacitors and SCRs in the inverter were replaced by the utility.

- One utility improved inverter performance by installing cooling fans on the top of each inverter cabinet.

- Fuse coordination was cited as a design problem by a maintenance supervisor whose plant had experienced several inverter trips due to blowing the input fuse to the inverter before the fuse in the branch circuit could operate. The fast acting fuses were required by the inverter manufacturer to ensure internal inverter circuitry protection.

Some of the actions taken by utilities who have experienced inverter and battery charger failures which affected plant safety and availability were to increase preventive maintenance scope and intervals, replace troublesome equipment, and improve system designs. Improvements in materials and procedures also help to reduce the failure rate and could explain the shape of the curve (Fig. 4-15) obtained when plotting inverter and charger failures against plant age.

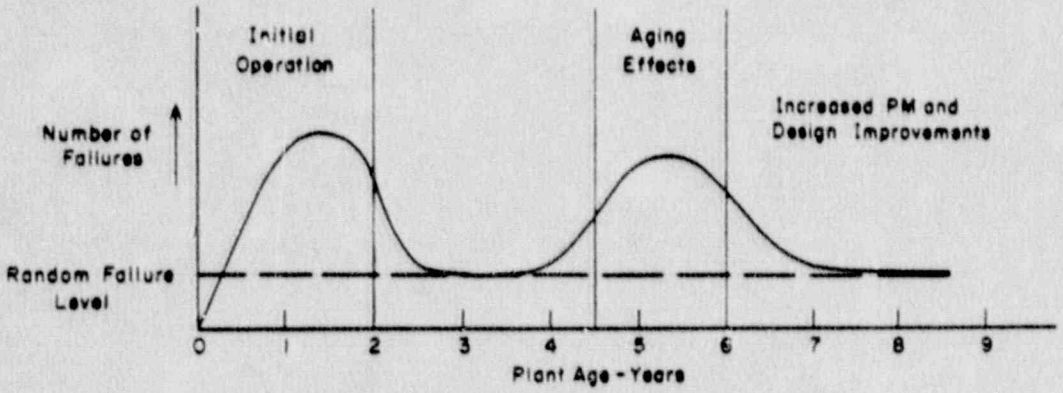

Figure 4-15: Battery Charger/Inverter Failure History

Failures early in plant life can be correlated to aging by considering the following:

- Electrical equipment is typically installed and energized early in the plant construction process. It is then subjected to electrical transients, dirt, extreme temperatures, and other stresses prevalent during the construction and preoperational testing phase which could contribute to failures when loads are placed on the equipment during early plant operation. Electrical overloads and dirt were two reasons given by an inverter manufacturer for equipment failures during plant startup. Feedback from field service personnel to the main office indicated that circuits

LICENSE RENEWAL WORKSHOP

SESSION 7

ELECTRICAL SYSTEMS

1. ADDITIONAL CRITERIA FOR ELECTRICAL EQUIPMENT INCLUDED IN THE E.Q. PROGRAM BUT NOT PERIODICALLY REPLACED

2. ADDITIONAL PROGRAMS TO ADDRESS AGING DEGRADATION OF ELECTRICAL EQUIPMENT LOCATED IN MILD ENVIRONMENTS

3. PROGRAMS TO ESTABLISH THE INSITU CONDITION OF CABLES AND COMPONENTS AND THE POTENTIAL FOR FUTURE DEGRADATION

4. REQUIREMENTS WITHIN THE RULE FOR ELECTRICAL EQUIPMENT IMPORTANT TO SAFETY

5. FUNCTIONAL TESTING OF ELECTRICAL EQUIPMENT AS A PREREQUISITE FOR LICENSE RENEWAL

NRC WORKSHOP ON LICENSE RENEWAL
NOVEMBER 13-14,1989
SESSION 7

PRESENTATION
ON
ELECTRICAL AND I&C SYSTEMS

BY
ROBERT R. MCCOY
YANKEE ATOMIC ELECTRIC COMPANY

ELECTRICAL AND I&C SYSTEMS

- PRIMARY FUNCTION TO PROVIDE POWER, CONTROL, INSTRUMENTATION TO FLUID AND MECHANICAL SYSTEMS
- GENERALLY COMPOSED OF SIMILAR, READILY REPLACEABLE COMPONENTS

SECTION XX.9
REQUIRES

- IDENTIFICATION OF DESIGN REQUIREMENTS, FUNCTIONS, AND ENVIRONMENTAL CONDITIONS
- IDENTIFICATION OF DEGRADATION MECHANISMS
- PROGRAM TO IDENTIFY, EVALUATE, AND TREND EFFECTS OF RELEVANT DEGRADATION

FOR ALL EQUIPMENT IMPORTANT TO SAFETY

SECTION XX.9 SCOPE
UNNECESSARY

- WELL RECOGNIZED THAT DEGRADATION CONCERNS DO NOT EXIST FOR MANY COMPONENTS BECAUSE OF:
  - -DESIGN CONSIDERATIONS
  - -BENIGN ENVIRONMENTAL CONDITIONS
  - -INSPECTION AND MAINTENANCE
  - -REFURBISHMENT OR REPLACEMENT

- PROCESS NEEDS TO CONSIDER THESE FACTORS SO THAT RESOURCES CAN BE FOCUSED ON THE AREAS WARRANTING ATTENTION

NRC EXPRESSED PHILOSOPHY

"Those structures, systems, and components that are effectively covered by existing ongoing NRC requirements and/or licensee programs, or are not subject to aging mechanisms need not be addressed in the application (and need not be within the scope of the hearing process)."

ELECTRICAL AND I&C COMPONENTS

- TEMPERATURE AND RADIATION EFFECTS ARE ARE MAJOR DEGRADATION CAUSES
- MAJORITY LOCATED IN MILD ENVIRONMENTS WHERE TEMPERATURE AND RADIATION CONTROLLED
- MAINTAINED/REFURBISHED/REPLACED THROUGH EXISTING PROGRAMS
- EXISTING PROGRAMS PROVEN EFFECTIVE

EXISTING PROGRAMS

- MONITOR/MAINTAIN/REFURBISH/REPLACE
- PROVEN DURING ORIGINAL LICENSING TERM
- CONTINUOUSLY UPDATED BASED ON INDUSTRY EXPERIENCE
- CONCLUSION - RULE SHOULD ALLOW FLEXIBILITY TO CREDIT THESE PROGRAMS
- AN EXAMPLE OF AN EXISTING PROGRAM WHICH COVERS DEGRADATION MECHANISMS IS THE ENVIRONMENTAL QULAIFICATION PROGRAM

DEGRADATION MECHANISMS

- IDENTIFIED AND GENERALLY WELL UNDERSTOOD BASED ON YEARS OF EXPERIENCE

- UNDERSTANDING OF ENVIRONMENTAL/MATERIALS INTERACTIONS CONTINUE TO DEVELOP
  - -THERMAL AND RADIATION EMBRITTLEMENT
  - -LOSS OF DIELECTRIC STRENGTH
  - -MECHANICAL WEAR

MANAGING DEGRADATION MECHANISMS

- PROGRAMS SHOULD ONLY BE REQUIRED FOR COMPONENTS IMPORTANT TO SAFETY
- NO ADDITIONAL PROGRAMS SHOULD BE REQUIRED FOR THOSE COMPONENTS ALREADY COVERED BY EXISTING PROGRAMS
  - -FOR EXAMPLE EQ
- RULE SHOULD ALLOW FLEXIBILITY FOR MANAGING DEGRADATION

TRENDING

NEED NOT BE REQUIRED UNILATERALLY, EXAMPLES:

- A PROGRAM EXISTS WHICH EFFECTIVELY MANAGES AGING BY REPLACEMENT PRIOR TO DEGRADATION NEED NOT TREND DEGRADATION:
  - -SET POINT DRIFT ON INSTRUMENTS
- A PROGRAM EXISTS WHICH SCHEDULES PERIODIC REFURBISHMENTS INVOLVING REPLACEMENT OF SHORT LIVED SUB-COMPONENTS NEED NOT TREND DEGRADATION
- A PROGRAM EXISTS WHICH SHOWS BY ANALYSIS THAT AGING IS NOT A CONCERN IF THE EQUIPMENT IS OPERATED WITHIN CERTAIN LIMITS NEED NOT TREND DEGRADATION
  - -NUMBER OF CYCLES, ENVIRNMENTAL CONDITIONS

NEED ONLY BE APPLIED WHERE MEANINGFUL OR JUSTIFIED

ADDITIONAL ADMINISTRATIVE CONTROLS

- ONLY APPLICABLE TO SPECIAL ACTIONS NECESSARY TO MANAGE AGE RELATED DEGRADATION IN SUPPORT OF LICENSE RENEWAL
- SUCH ACTIONS BECOME LICENSE COMMITMENTS FOR LICENSE RENEWAL

SECTION XX.9

SHOULD PRESENT A SCREENING TYPE PROCESS

- EQUIPMENT IMPORTANT TO SAFETY
- EQUIPMENT NOT COVERED UNDER EXISTING PROGRAMS
- EQUIPMENT SUBJECT TO POTENTIALLY SIGNIFICANT DEGRADATION

ADD FLEXIBILITY IN IMPLEMENTATION

SEVERAL METHODS AVAILABLE FOR MANAGING DEGRADATION

- FURTHER ANALYSIS TO DEMONSTRATE THAT THE PROJECTED DEGRADATION IS ACCEPTABLE THROUGH THE RENEWAL PERIOD
- CURRENT PROGRAMS ARE ADEQUATE TO ASSURE DEGRADATION MECHANISM DOES NOT IMPACT SAFETY
- FOR THE RENEWAL PERIOD PROCEDURAL ENHANCEMENT MAY BE APPROPRIATE
  - For example: Trending
- MODIFICATIONS TO OPERATING PRACTICES
- COMPONENT REPLACEMENT OR REFURBISHMENT