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Proceedings of the

Workshop on Program for Elimination of Requirements Marginal to Safety

Held at
Holiday Inn
Bethesda, MD
April 27–28, 1993

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Abstract

These are the proceedings of the Public Workshop on the U. S. Nuclear Regulatory Commission's Program for Elimination of Requirements Marginal to Safety. The workshop was held at the Holiday Inn, Bethesda, on April 27 and 28, 1993. The purpose of the workshop was to provide an opportunity for public and industry input to the program.

The workshop addressed the institutionalization of the program to review regulations with the purpose of eliminating those that are marginal. The objective is to avoid the dilution of safety efforts. One session was devoted to discussion of the framework for a performance-based regulatory approach. In addition, panelists and attendees discussed scope, schedules and status of specific regulatory items: containment leakage testing requirements, fire protection requirements, requirements for environmental qualification of electrical equipment, requests for information under 10CFR50.54(f), requirements for combustible gas control systems, and quality assurance requirements.

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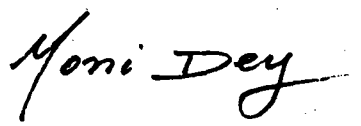
Preface

As part of the Nuclear Regulatory Commission's continuing program (57 FR 55156) to eliminate requirements that are marginal to safety and yet impose a regulatory burden, the NRC conducted a public workshop on April 27 and 28, 1993 in Bethesda, Maryland. The purpose of the workshop was to provide information on the NRC program, solicit input from the public and regulated industry on the program, and to discuss a number of specific initiatives being considered. The NRC encouraged the public and the regulated industry to attend the workshop and provide input to the NRC in the early stages of the program. In order to facilitate discussions at the workshop, advanced material on a framework for a performance-based regulatory approach, and applications to three specific rulemakings was published (58 FR 6196) prior to the workshop.

The workshop commenced with introductory remarks from the NRC on the objectives of the workshop, and a review of the program including scope, schedules, and status of specific items. The workshop was organized into nine panel sessions on technical topics, and general regulatory and institutional issues, with about six members in each panel. All requests from the public to participate in the panel discussions were accomodated. Each panelist provided a presentation on his or her views, experiences, and comments on the topic of the panel discussion. This was followed by a discussion among the panel members and members of the general public attending the panel discussion session. Over three hundred and twenty people attended the two-day workshop including representatives from forty-four utilities, five industry groups, eight vendors, thirty-four engineering and consulting firms, four public interest groups, and six state, federal, and international government agencies. Representatives from an international union, law firms and academia were also present. This was an excellent group of people which resulted in a very productive workshop.

This proceeding details the results of the public workshop and mirrors the workshop's organization. Each of the sections contain the following information: the speeches made by the moderator and panelists - these have been edited for clarity; the slides used by each panelist; and a summary of the general audience discussion for each session. In addition, this proceeding includes an executive summary, and a complete list and summary of recommendations made by workshop participants.



Dr. Moni Dey
Workshop Organizer
Office of Nuclear Regulatory Research
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1. Executive Summary

This section summarizes comments made at the workshop. The purpose of the workshop was to solicit ideas and comments from the public and industry in an open manner. This summary and these proceedings record ideas and comments provided by attendees, without endorsement or rejection by the NRC.

Introductory and Opening Remarks:

The NRC has instituted a continuing program to eliminate requirements that are marginal to safety. The basic objective is to avoid dilution of safety efforts by reducing resource application to marginal safety issues. This improvement in efficiency will result in a net beneficial effect on safety. Success in this institutionalized process will require cultural changes in both the industry and the NRC. Industry needs to better appreciate the regulatory perspective in its implementation of regulations and its proposals for change. The NRC needs to adopt a more responsive approach to implementation and enforcement of its regulations.

Changing the established order of nuclear regulation requires the introduction of new information. A great deal of new information has been developed during the period since many of the existing regulations were first issued. The use of historical data, industry experience, and risk assessment can form the basis for regulatory improvements. In some cases, changes in the manner of implementation can effect the improvements without a change in the rules.

Framework for a Performance-Based Regulatory Approach:

Preliminary criteria for performance-based rules are: to establish regulatory objectives derived from risk and safety goal considerations; to allow licensees flexibility to use cost-effective measures to accomplish the objectives; to establish detailed methods for acceptance of the licensees' performance relative to the objectives, and to make the change from existing rules to the new rules optional for current licensees.

Performance-based regulations developed using risk insights based on probabilistic safety analyses will likely result in improved safety by allowing available resources to focus on the more important safety issues. However, the use of performance-based regulations will require the development of agreed performance criteria and methods of measuring performance. Otherwise, there will be the uncertainty of regulatory acceptance, and there may be an unacceptably wide range in the quality of licensee performance. In some cases, deterministic rules based on lessons learned may be preferable to performance-based rules. Current industry problems are due more to the way the staff has implemented the existing rules than from the rules themselves.

Public acceptance of nuclear power depends more on achieving public trust than it does on achieving public understanding of the technology. The good performers among licensees do not require rules; the poor performers usually require prescriptive rules. Considering the uncertainties associated with risk assessments, a considerable level of regulatory conservatism will be in the public interest.

Containment Leakage Testing Requirements—Leakage Rate and 10CFR50 Appendix J:

Containment leakage tests confirm and provide confidence the allowable leakage rate will not be exceeded for postulated accidents. The current intervals specified for leak rate testing had no data basis when instituted. Test results to date justify the use of leak test results to determine the interval to the next test. The maximum interval could be ten years, with the minimum interval determined by the next plant shutdown. For component testing, design and application factors should also be considered. A failure due to a test deficiency is not a leakage rate test failure; it might require the test to be repeated but should not affect the interval determination.

Other important issues to be resolved relate to staff implementation of the rule, rather than the rule itself. Flexibility in required test technology can significantly reduce cost (e.g.,

by reducing test duration) without affecting safety. A critical issue is the choice of "as found" vs. "as left" leakage rate testing. Studies have shown that risk is sensitive to containment breach and bypass and insensitive to leakage rate.

Fire Protection Requirements:

The number of approved exemptions from Appendix R indicates that a less prescriptive rule is both possible and desirable. Moving the detailed requirements of Appendix R to a Regulatory Guide is not enough. Many of the burdensome requirements are not embodied in the rule but are imposed by staff interpretations, such as Generic Letters, etc. A performance-based approach can be developed within the existing Appendix R structure, using risk assessment to improve efficiency by focusing efforts on risk-significant issues.

The apposition of the terms "performance-based" and "prescriptive" needs to be explained, since the required performance will be prescribed. As with any regulatory requirement, performance-based fire protection rules will require the definition of functional objectives and acceptance criteria. Major improvements in the ability to characterize and analyze fires have been made since Appendix R was issued; however, large uncertainties continue to exist. The change from prescriptive rules to non-prescriptive rules will reduce public trust unless there are criteria in place to support this change.

Requirements for Environmental Qualification of Electrical Equipment:

The "one size fits all" approach to equipment qualification testing results in resource expenditures that go far beyond what is justified by the risk significance of some equipment. This problem arises more from the staff implementation than from the rule itself, for example, in the prescriptive application of non-prescriptive guidance, such as Regulatory Guide 1.97. One result is that the licensees do not use the flexibility available in the rules and guidance due to the uncertainty of staff acceptance. The uncertainties in some methods (e.g., aging extrapolation) argue in favor of greater flexibility in application of regulatory requirements.

Regulatory consistency and implementation efficiency will be improved by focusing on risk significant equipment and environmental conditions. In addition, the level of qualification should depend on risk significance, and consideration should be given to the risk significance of the post-accident operability period. More realistic source terms should be used, including reconsideration of the applicability of "leak-before-break" criteria to qualification of equipment. Excessive qualification requirements discourage the introduction of upgraded or new types of equipment that could improve safety.

Requests for Information under 10CFR50.54(f):

Some information requests under 10CFR 50.54(f) impose new requirements or re-interpret existing requirements, and should be implemented pursuant to the backfit rule, 10CFR 50.109. Some of these requests may be inappropriately implemented under 10CFR 50.54(f) due to underestimated costs in staff cost benefit analyses that are lacking in rigor and documentation. Such underestimates also cause problems between the utilities and public utility commissions.

Industry speakers suggested that the staff should more rigorously distinguish between information requirements properly pursued under 50.54(f) and new requirements properly pursued under 50.109. They should also avoid unnecessarily drawing conclusions concerning the appropriate resolution of the problem, leaving room for utility proposals. The industry should improve their responses by addressing 50.54(f) requests in the context of the rule, and by proposing resolutions acceptable to both the industry and the staff. To facilitate these improvements, the following two sentences have been proposed for inclusion after the second sentence in 50.54(f):

> "Where the information is sought to verify licensee compliance with the current licensing basis, the staff will identify the specific regulation or other provision of the licensing basis for which verification is sought. Where the information request would

result in the establishment of a new program, including testing or analysis, or an extensive study using new criteria, in order to develop the information required, the provisions of 10CFR50.109 will be followed."

Requirements for Combustible Gas Control Systems:

Industry agrees with the potential changes proposed by the staff, including: the replacement of 10CFR50.44 and 10CFR50.34(f)(ix) with a performance-based rule, and the transfer of staff positions on methods to meet regulatory requirements to a Regulatory Guide. In addition, several specific technical issues should be resolved, based on the improved information currently available on those issues, e.g., eliminate recombiners from large dry and sub-atmospheric containments; resolve inconsistencies between rules and standard technical specifications regarding zirconium alloy fuel rods, and revise the method of dealing with the quantity of hydrogen to be assumed or calculated.

Quality Assurance Requirements:

Although 10CFR50 Appendix B is basically sound and allows some flexibility in application, it is focused mainly on design, and its language encourages a focus on form, rather than performance. The proliferation of implementation guidance has been driven by quality assurance practitioners and gives emphasis to compliance and documentation. Independent quality assurance organizations, as mandated by existing requirements, tend also to focus on compliance, rather than quality performance. Quality assurance needs to become a function of the entire organization – managers, supervisors, and workers, and not just the quality assurance organization.

Detailed and burdensome quality assurance requirements have discouraged the introduction of new products into the nuclear power market. Many other countries have used 10CFR50 Appendix B as their guidelines, but apply a less strict interpretation of the requirements. Department of Energy Order 5700.6C, "Quality Assurance" is an example of a proper interpretation of Appendix B requirements.

The needed changes do not require, but would be facilitated by, revision of Appendix B. Using the insights provided by risk assessments, quality assurance should be focused on the areas that have risk significance, perhaps using core damage frequency as a measure of quality performance. Quality assurance audits could be replaced by performance monitoring activities. Attendees indicated that what is needed is a cultural change to be reflected in both the industry approach and in the NRC's implementation, inspection and enforcement.

Physical Protection for Power Reactors:

Utilities believe that the effects of employee screening and fitness for duty programs require a revised definition of the insider threat, and justify reducing the need for certain physical security measures, e.g., vital area door locks and alarms; escort of vehicles with cleared drivers; re-search of guards, and the use of a watchman at containment during outages. Cost effectiveness can be improved by reallocating resources from these areas to other security purposes. Excessive security requirements also can have a negative effect on operational, including safety, effectiveness.

Guard union representatives believe that certain of the proposed changes would be acceptable, but that others would degrade security. Some changes made in response to a revised insider threat could affect the ability to deal with the outsider threat. Cost should not be the controlling factor in security operations.

Representatives of public interest groups did not want any reduction of security. The possible effect on safety of security firm competition for contracts with nuclear power plants was a matter of concern.

2. Introductory Remarks

2.1 Eric Beckjord
Nuclear Regulatory Commission

This morning I wish to extend my welcome to all of you who have come here today for this important public workshop of the Nuclear Regulatory Commission concerning Elimination of Requirements Marginal to Safety.

The purpose of this two-day workshop is to discuss the issues and to hear your views on them, and to prepare the process for carrying out the program for eliminating requirements marginal to safety.

There are eight issues that will be discussed. These are:

1. Framework for a Performance-Based Regulatory Approach
2. Containment Leakage Testing Requirements
3. Fire Protection Requirements
4. Requirements for Combustible Gas Control Systems
5. Requests for Information
6. Quality Assurance Requirements
7. Requirements for Environmental Qualification of Electrical Equipment
8. Requirements for Physical Protection for Power Reactors

There will be a panel discussion and a general discussion for each issue. These are the issues that are the subject of the workshop today and tomorrow. It is possible that additional issues will come up for discussion later.

Here today are forty-four utilities, five industry groups, eight vendors, six state, federal, and international government agencies, four public interest groups, and twenty-three engineering and consulting companies. We also have representatives of an international union, law firms and academia. This is an excellent group of people which should result in a very productive workshop. I am quite sure that your comments and ideas will be very useful and important to us in doing our tasks. Of course the NRC considers this to be a very important program. Chairman Selin and the Executive Director of Operations, Jim Taylor, are here to speak to you about that. After their introductory remarks, Frank Gillespie and Moni Dey will provide an overview of some of the issues under consideration. I will then invite the public and industry to provide their introductory remarks and comments on the presentations this morning.

When we first started planning this meeting, we anticipated that perhaps fifty to a hundred people would participate. We are pleased that over two-hundred and fifty of you have pre-registered to come and provide us with your ideas and comments during this workshop. Our accommodations will be a little tight, but we will try to make things go as smoothly as possible.

I emphasize that we are conducting this workshop to solicit your ideas. The NRC staff is not here to tell you about or defend staff positions, because we do not have any at this stage. We are not here to endorse or reject any particular ideas, either. We are here to listen, and maybe to ask questions so that we would understand your views more clearly.

I now turn to Chairman Selin for his views on the subject and then to Jim Taylor, the Executive Director for Operations. They will tell you how we arrived at this point, why we are here today, and where we go from here. Now, it is my pleasure to introduce to you Ivan Selin, Chairman of the U.S. Nuclear Regulatory Commission.

2.2 Ivan Selin
Nuclear Regulatory Commission

Good morning ladies and gentlemen. I am pleased to be here to welcome each of you personally to this, the first major NRC public workshop on eliminating requirements that are marginal to safety. This event marks a new approach to nuclear regulation in which the NRC, jointly with the public and the nuclear industry, seeks continually to improve its

regulations. I want to express my appreciation for your willingness to join us today and invite your active participation in today's program.

This topic represents something near and dear to my heart. There is no excuse for a government agency inflicting any greater burden on its supporting public than is absolutely necessary, which would be reason enough for the major push which this conference is kicking off. But there is an even more basic reason for trying to make our regulation more systematic, predictable, and efficient in its impact on our licensees.

The major reason for seeking to remove inefficient regulations is safety—to free up resources which can be shifted to more productive safety uses. Programs that result in a better allocation of resources for competing risks are worthy of staff resources and are consistent with the mission of the agency.

As I have noted on other occasions this year, NUMARC is to be commended for citing specific examples of changes to NRC regulations and regulatory practices that the industry believes are appropriate. These examples were based upon the industry's knowledge and experience in the operation and management of commercial nuclear power plants and the maturity of the nuclear technology; they were phrased in analytical rather than anecdotal terms.

The Commission with equal enthusiasm welcomes the views of interested members of the public on these regulatory issues. We believe the general public has an important role to play particularly in signaling areas where our policies could be cleaner, and therefore where our regulations could be more sharply held up to the light for evaluation.

The Commission's decision to institutionalize the elimination of requirements marginal to safety came about largely in response to your comments on the February 4, 1992 Federal Register Notice. Several commenters, many of whom are here with us today, recommended that the Commission develop a program and dedicate staff resources to a continuing examination of NRC regulations.

You pointed out a number of areas where the regulatory burden was underestimated and others where obsolete regulations should have been purged but were left on the books. If new regulations, for instance performance-based rules, add to instead of replacing the older body of regulations, our drive to reform won't get much popular support. A lot of good proposals have been generated in the past year or so, even though significant NRC and industry resources will be required to evaluate and implement them. In August 1992, the Commission approved a plan to tackle this large list of proposals, and to formalize the ongoing effort to eliminate requirements marginal to safety. This process is designed to focus licensee and NRC resources, and to ensure that regulatory improvements continue to evolve. Mr. Taylor, the Executive Director for Operations, will describe the periodic process which is to be followed. Before he does so, I would like to touch upon two points that I think are particularly important:

First, the institutions involved must provide the right framework for regulatory improvements. A process, which Mr. Taylor will describe, allows for continued review, and establishes procedures for improvement where necessary. However, we need to ensure the process stays vital, and does not degenerate into a series of case-by-case decisions burdened by an appearance of coziness and accommodation. We are looking for your comments at this workshop on this issue and how to best accomplish this.

Secondly, and equally important, is the culture of the institutions. And I mean both the NRC and the industry.

An institutionalized process cannot by itself improve or change unless there are cultural changes. Later you will hear of our initiatives to develop and implement approaches to move from a programmatic and compliance based approach to one that is performance-oriented and risk based. There is no cookbook approach to making such a major change. Leadership is useful, but the real support for positive change must come from the ranks. Innovation must be encouraged, even as it is channeled.

The marginal requirements program has identified a number of technical subject areas for regulatory action. Rulemaking activities have already been initiated for some of these activities. The Regulatory Review Group will extend this generic effort to plant-specific applications as part of a more complete examination of the current regulatory

framework. Frank Gillespie will provide an overview of some of the issues the Group is considering later in the program.

Let me leave you with these two thoughts:

1. How do we effect cultural change in our institutions?

2. What role will each of us play in order to ensure regulatory improvements continue to evolve? I look forward to hearing your comments on these thoughts at this meeting, and invite you to join us in the challenges that lie ahead.

2.3 James M. Taylor
Nuclear Regulatory Commission

I regard this workshop as an important milestone in this program. It is important at this time because we need to move to the next phase past the identification of issues associated with regulations to address the appropriate paths for resolution.

This program on marginal to safety requirements had its beginning in 1984 but we all realize progress has been very slow. With the extensive list of issues identified to date, the rate of resolution must be an important part of any discussion. To improve the rate of resolution each discussion here must also focus on the method of achieving resolution relative to the role of the NRC as the regulator and the role of the industry as both the regulated and the potential beneficiary.

I will describe the plans the staff has established to provide a continuing effort and a potential expanded role for industry. Later, Frank Gillespie will provide an overview and examples of the insights from the Regulatory Review Task Group, which parallel the challenge before the workshop. Moni Dey then will describe the issues being considered in the marginal-to-safety program relating to performance-based regulatory approaches to be discussed at this workshop. After the Regulatory Review Group completes its efforts in July of this year, the regulatory products being considered will be combined with the marginal-to-safety program into one continuing effort. This morning, I will focus my remarks on the management and procedural aspects of executing these initiatives on a continuing basis.

First, let me describe the periodic process NRC has established to ensure that your proposals are considered by the staff, and that regulatory improvements continue to evolve.

In response to several NRC requests for comments and proposals for regulatory review, the public and industry have responded with interest. In the special review conducted by the committee to review generic requirements over one hundred proposals were generated. Several proposals were also provided in response to requests related to the marginal-to safety program. The staff believes that eight issues may warrant action at this time in the marginal-to-safety program and that about fifteen items should be deferred. The first slide lists the eight areas now under consideration which will be discussed in this workshop.

Areas under Consideration

- Containment Structure Leakage Testing
- Fire Protection
- Post-Accident Combustible Gas Control
- Procedures for Requests for Information
- Quality Assurance
- Environmental Qualification
- Plant Security
- Post-Accident Sampling Systems

James Taylor - slide 1

Given the number of proposals that have been generated in the past year or so, the staff has established, with Commission approval, a systematic continuing effort which will consist of three-year periods during which a series of actions will be undertaken. Figure 2.3.1 illustrates the actions that will be taken in each period. Public input will be solicited for determining NRC actions and to adjust NRC priorities. Public workshops, like this one, will be conducted to assure that all parties: public, industry and other regulatory authorities have a voice in developing proposals already identified and for identifying new proposals. Having discussed the process for identifying and reviewing issues let me turn to the more

Figure 2.3.1
Periodic Review of Regulatory Requirements and Practices

2/92	Start of Period 8/92	← 3 Years → 2/95	End of Period/ Start of New Period 8/95
• Published proposed NRC actions for comment	• Initiated staff action on NRC proposals		• Complete actions initiated in 1st period
• Solicited other proposals from public	• Initiated staff analyses of meritorious public proposals	• Based on staff analyses publish 2nd set of proposed NRC actions	• Initiate staff actions on NRC proposals
		• Solicit other proposals from public	• Initiate staff analyses of meritorious public proposals

important topic of resolution of these issues. The industry is in the best position to not only state the burden that a particular regulation imposes, but also the most cost-effective alternative approaches. One additional piece of information needs to be provided, that is, the impact of any alternative approach should have a marginal or minimal effect on safety. If these are provided by industry, we have set the stage for an expanded industry role and most likely the rapid resolution of those issues most important to you.

As a catalyst for discussion, let me briefly discuss an idea which clearly shifts a resource burden from the NRC to the industry but has the potential for a more responsive program.

This idea is the expanded use by the industry of petitions for rulemaking, now principally utilized by the public.

If this petition identifies alternative approaches, fully supported by analysis and supporting data as to its marginal safety impact, the staff could move smartly to review and publish the approach as a proposed rule leading to subsequent publication as a final rule. The major consideration is the depth and scope of the technical support for the petition and its ability to sustain NRC and public scrutiny. This public standard is severe and resource intensive and is one of the causes of the slow pace of this program to date. The example I would cite is the slow progress on modifications to Appendix J.

These efforts will prove successful only with your assistance and in depth involvement. The industry knows well the economic burden imposed by selected regulations, and by means of your safety analysis, such as PRA or IPE studies, can also assess the safety importance of such requirements. On specific instances where you believe there are large burdens and minimal safety impacts associated with a requirement, you should not only share your analysis with us but aggressively propose alternatives. The same consideration and factors that resulted in your conclusion should help us in our evaluation and execution of any proposed modifications. I want to emphasize the need for industry resources and participation in the process of developing performance-based regulatory approaches. Submittal of detailed industry proposals with supporting analysis for increased flexibility

for implementation is a key element of such approaches.

I also recognize the need for continuing staff focus to ensure that sufficient priority is given to this subject commensurate with the interest, efforts, and proposals provided by the public and industry. I am currently reviewing staff resources to determine the optimal and most effective allocation of staff resources to effect sufficient regulatory improvements on a continuing basis.

I wish you a productive workshop and look forward to your comments and participation in the challenging tasks that lie ahead.

2.4 Frank Gillespie
Nuclear Regulatory Commission

One of the Commission's principles of good regulatory practice is efficiency. A key element is that regulatory activities should be consistent with the degree of risk reduction they achieve. Where several effective alternatives are available, the option that requires the fewest resources should be adopted.

Principles of Good Regulation

Efficiency-the—American taxpayer, the rate-paying consumer, and licensees are all entitled to the best possible management and administration of regulatory activities. The highest technical and managerial competence is required, and must be a constant agency goal. NRC must establish means to evaluate and continually upgrade its regulatory capabilities. Regulatory activities should be consistent with the degree of risk reduction they achieve. Where several effective alternatives are available, the option which minimizes the use of resources should be adopted. Regulatory decisions should be made without undue delay.

Frank Gillespie—slide 1.

To achieve this principle, we must assess the processes by which we develop regulations. In 1984, I was the Division Director that started the Marginal to Safety Program, so I have a historical view of this process, which is ongoing. Indeed, part of the challenge that the Chairman laid before my Task Group at our briefing three weeks ago was to focus not only on the paper but on the processes, too.

As has been noted, the NRC needs to be responsive to what is occurring in the industry. At the same time, however, the industry needs to participate in developing technical bases. To a degree, that means you need to put yourselves in our role and ask, "What would they want? What do I have to give them?"

This reflects a change in our relationship: As everyone knows, there used to be a tendency to petition for rulemakings and licensing actions that dealt strictly with economic issues and not with upgrading safety. In 1987, every facility in the country was informed by its project manager that those types of petitions were going to the bottom of the priority list. Now we are seeing some process changes to try to address safety and economic efficiency.

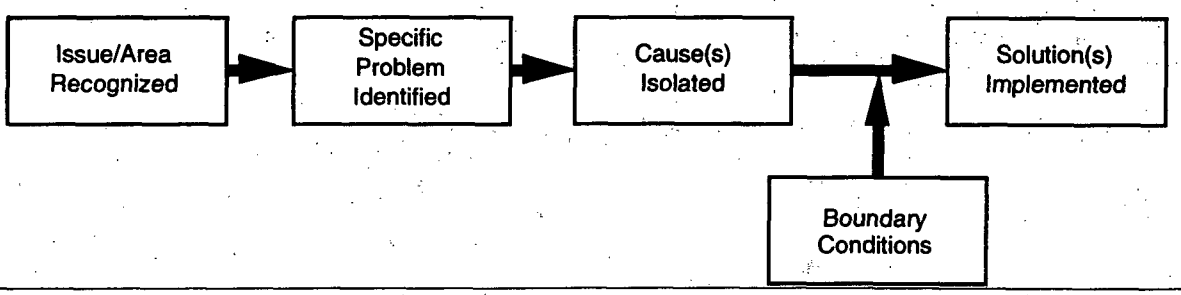
One thing we have recognized is that the rules in and of themselves may not be the problem. We have identified few rules beyond the list of about 100 that the industry identified. In fact, we had a hard time finding all 100 rules. Sixty percent of Part 50 deals with how to prepare a construction permit, how to go to a hearing, and similar activities. There are not that many rules in Part 50.

In addition to the rules, there are the NRC guidance and industry standards. In many cases, the NRC guidance endorses industry standards. If I go to a strictly performance-based regulation, what will I achieve? For example, if I take Appendix R and move it into a Regulatory Guide, what will I achieve? Probably I will succeed at keeping costs about the same. I will have a performance-based regulation, but my inspectors, my reviewers, and your engineers are still going to fall back on the only available written guidance. Obviously, it is less important where the guidance is than what it tells you.

To this end, I have received the benefit of new technical information during the third phase of the activities our Task Group performed, which address risk-based regulations.

Right now, the one source of new insights that is available and that affects all areas across the board is probabilistic risk analysis or probabilistic safety analysis. I will use those terms interchangeably. In the past, we have had a simple resolution process by which to review each rule and all the input received. To a degree, we had to duplicate what many other organizations had already done.

Figure 2.4.1
Resolution Process



Without the addition of new information, it is going to be very difficult to show how alternatives are equally valid for marginal safety space. New information can include evidence that a new metal provides better integrity for a steam generator tube. New information can be a new analysis, a new approach, or an integrated approach. (See Figure 2.4.1) That is what PRA gives you—an integrated approach across areas that had, traditionally, been distinct.

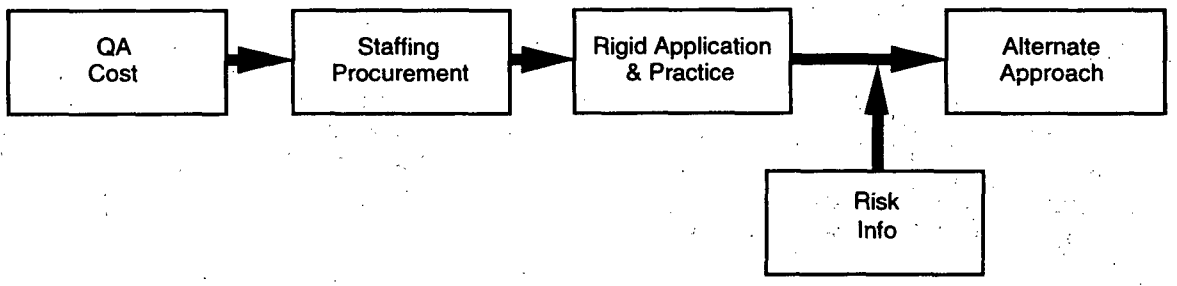
Quality assurance, of course, affects both procurement and the more traditional concept of quality assurance/quality control at the facility. What are the problems associated with quality assurance? For one thing, it costs a lot. According to public comments, we are not getting a lot for the money being spent on QA documentation, particularly in the procurement area.

Reading Criterion 2 in Appendix B literally, we should provide QA in proportion to its bearing on safety. References to the QA structure under Appendix B can be found in ANSI 3.2 or 18.7, or NQA-1, or NQA-2, or N45. How do the engineer, the reviewer, and the inspector react to this structure? They take the most conservative approach, which is to apply every requirement. (See Figure 2.4.2)

How do we change that process? Through risk information, it is possible to arrive at an alternative approach, which almost has to be a completely distinct alternative. Yet risk information alone is probably not going to be definitive enough. There will be a need to in some way institutionalize the new process . So then we will have to deal not only with Appendix B, but with an entire superstructure of industry standards.

The NRC has promulgated regulatory guides that endorse industry standards. But because you in the industry have dominant control over establishment of these standards, it is up to you to challenge the positions we have taken. The NRC has an obligation to be receptive to those challenges. Thus we have mutual responsibilities for our regulatory framework. Admittedly, this is a change in function.

Figure 2.4.2
Sample Resolution



Changes to Areas under Licensee Control

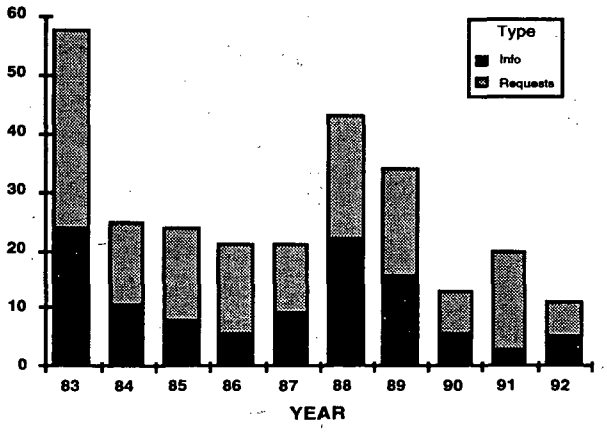
- 10x50.54 - Quality Assurance, Safeguards, and Emergency Preparedness
- Allows Changes Which Do Not Reduce or Decrease Commitments or Effectiveness
- Lack of Definitions for Effectiveness and Commitments

Frank Gillespie—slide 2.

In addition to our assessment of quality assurance, our Task Group looked at safeguards and at emergency preparedness.

With regard to safeguards, the problem is one that occurs in practice. Anecdotal evidence indicates that licensee requirements are being ratcheted. Once an inspector cites something as an unresolved issue, the NRC is committed to taking action on it. During the course of the NRC's RAR reviews, which are not inspections but a type of audit, weaknesses are cited as well. Because no facility wants to receive an inspection report that notes a weakness, everyone takes action to avoid such a finding. It is easy enough to do so because 10CFR73, which governs the change mechanism for security and is parallel with quality assurance and EP, states that a licensee can upgrade any and everything it desires. However, if a licensee wants to decrease safeguards, it takes a license amendment to do so. Thus we have a regulatory framework that is conducive to the process of ratcheting.

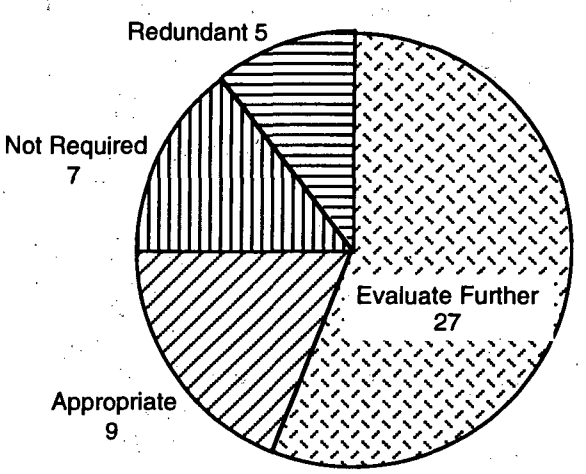
Figure 2.4.3
Number and Types of Generic Communications Issued



In our final report, our Task Group offers some recommendations to overcome this tendency to raise standards unnecessarily through the inspection process. However, the true solution is to pinpoint what "good enough" actually amounts to in the security area.

Part 73.55(a) is a performance requirement, which stipulates the need of a security system to protect against a threat. At a minimum, a facility must comply with paragraphs (e) through (h) of that Part, which are fairly prescriptive. In terms of staffing, compliance with (e) through (h) translates into about 13 people per shift. I have a feeling that most utilities have more than 13 people per shift on duty in accordance with their security plans. Here we have a performance-based regulation that has a very prescriptive implementation.

Figure 2.4.4
Repetitive Reports



The Task Group also recognized the difference that exists between a commitment and a plan. Both the NRC and the industry have allowed the difference to blur over the years. In quality assurance, for example, a clear difference should be seen between a plan submitted to demonstrate how a facility is going to carry out a commitment, and the commitment itself. Yet we generally view commitments and plans as the same. In fact, some plans are written in ways that imply they are to be viewed as commitments.

As a consequence, almost any desire to make a change has been viewed as a desire to make a change in commitment, which needs prior NRC approval. This is the type of flaw that we are beginning to recognize and address.

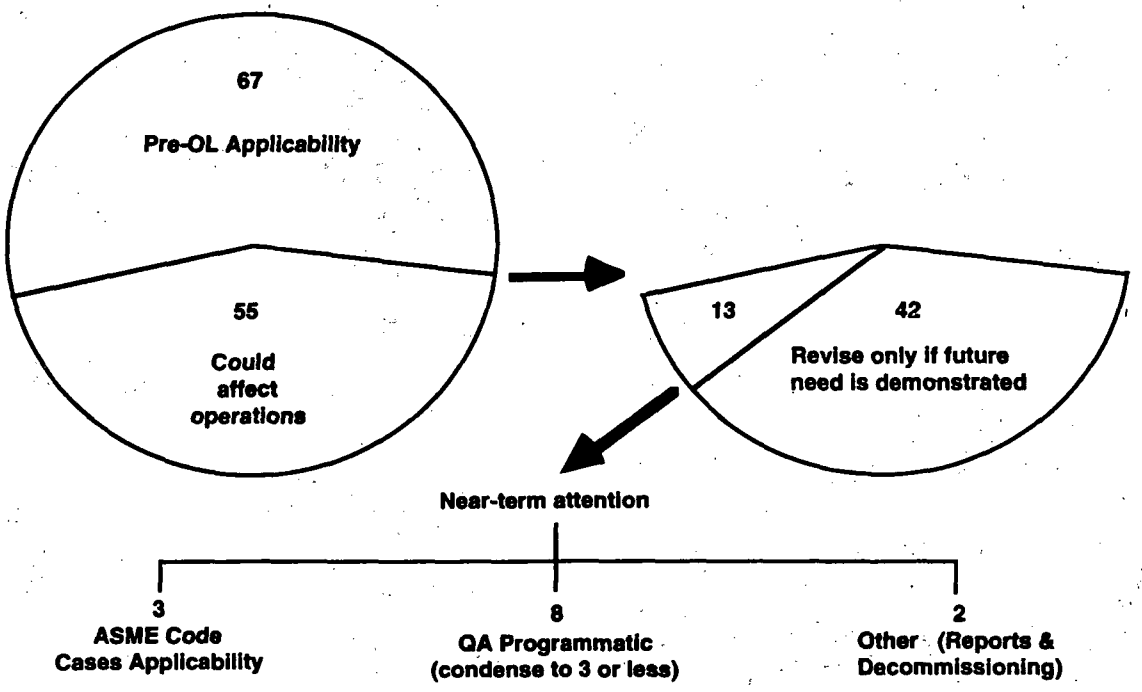
In another workshop session, 10CFR50.54(f) is being discussed, which provides the regulator authority to request information; basically, the authority for bulletins and generic letters. In the last year, the Commission took action to encourage public comment on the technical content of five generic letters and their impacts in terms of cost. We've gone from issuing over 20 action letters in 1988 to issuing five in 1992 (see Figure 2.4.3) and we've put into place a process requiring public participation and providing the opportunity to comment on each technical approach proposed. With this in mind, I question whether 50.54(f) is an area we want to focus our limited resources on right now, or if, in fact, the problem largely has been fixed.

The Task Group also looked at reporting requirements. We compared the regulations in a specific license to the number of reporting requirements in our NUREG and could not come up with the 1,800 that exist in the NUREG.

We did come up with requirements that seemed worth examining for possible elimination: Five were redundant, seven appeared not to be required at all, and the retention of 27 was debatable. (See Figure 2.4.4) In our report, we include a matrix of questions we asked and the answers we got during the review process, so people can see what we've done. Our review suggests that the scope of the problem experienced with reporting requirements has become much less severe. Also, by the way, the requirements that should be eliminated tend to be ones that get taken out by the new improved Tech Spec program.

We also looked at the complete 122 Division 1 Regulatory Guides and identified which ones need near-term attention and which ones really are not applicable to operating reactors. Eight

Figure 2.4.5
Reg Guides & Operating Facilities
122 Division 1 Reg Guides



of the guides deal with QA, yet only as a remnant of the construction phase . What was really seen as absent was a concise statement of what the NRC expects in the way of quality assurance at operating reactors. (See Figure 2.4.5)

Risk-based regulation can be applied to maintenance, quality assurance, ISI/IST, Tech Specs with two pieces, and FSAR changes where an integral look might be useful. (See Figure 2.4.6)

Categories of Use of Risk Information

- Risk Insights
- Risk Based Regulation
- Risk Meter

Frank Gillespie—slide 13.

Eventually, risk-based regulation will consist of three levels: risk insight, risk-based regulation, and use of a risk meter. Clearly, I don't think we're ready to use a risk meter. I think we are at the risk insight level; some other people may be at the risk-based level.

To summarize how we would make use of risk insights, I will focus on graded QA.

Degree of Detail Depends on Application

Type A Primary Reliance on Qualitative Risk Insights

- Examples:
  - Maintenance Rule
  - Graded QA
- Requirements:
  - Average PRA Modeling
  - IPE-Type Review by NRC Staff
  - Generic Failure Rate Data
  - PRA Updates on Refueling Outage Basis
- Comment:
  - Maintenance Rule Guidance Applicable to QA Applications

Frank Gillespie—slide 14.

In averaging Surry and Sequoyah PRAs, there are only about 200 components whose individual contributions to risk are at the 10E-7 level. Risk analysts define components differently than do engineers and they tend to consolidate things. Nevertheless, I'm certainly very, very far away from a list of 10,000 safety-grade components, which is a number that periodically comes up. (See Figure 2.4.7)

Figure 2.4.6
Risk Based Regulation

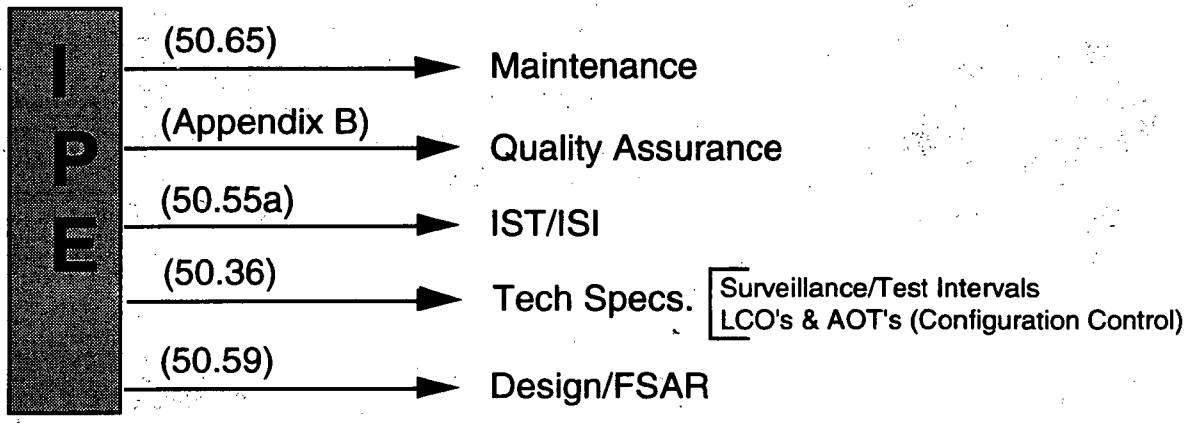


Figure 2.4.7
Component Risk Importance

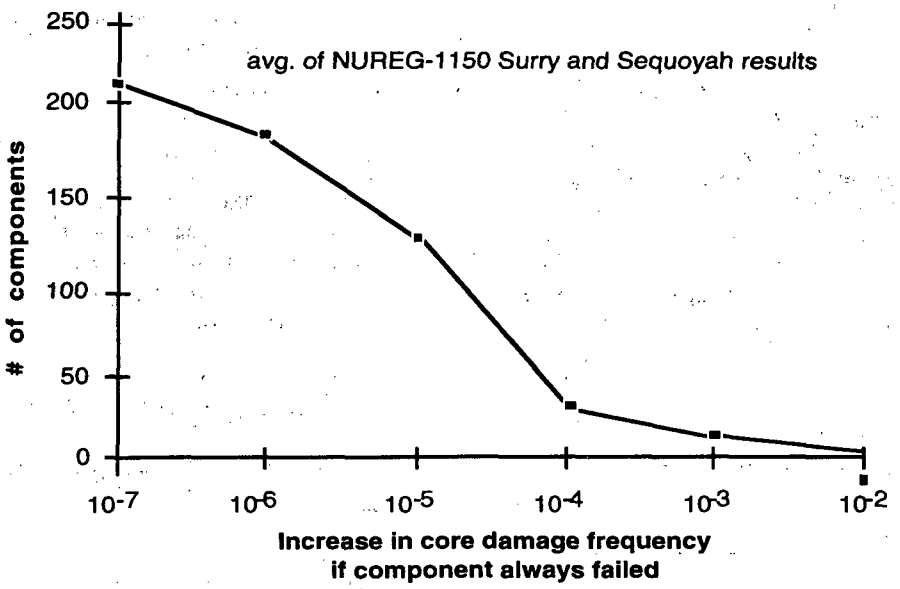
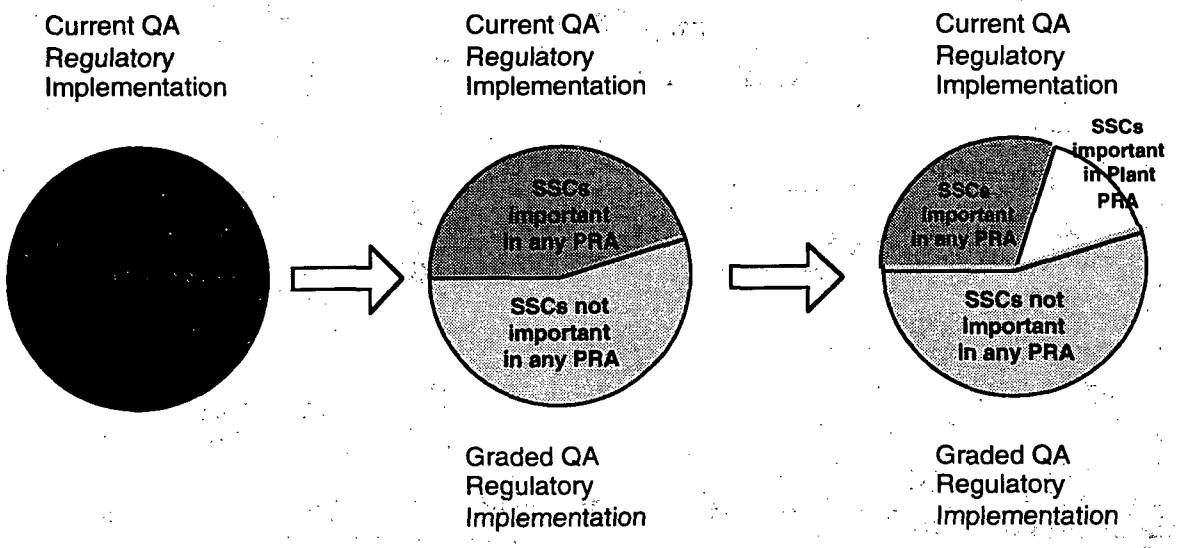


Figure 2.4.8 shows a schematic approach to how risk insights and then the risk-based level might surface in QA. Right now you've got the Q-List. On the Q-List is a set of components generally modeled in the PRA. Some are not. Some are inherent in PRA assumptions like the reactor vessel, which you just have to deterministically carry through.

If I have a subset in a class of reactors and take, say, BWR 6's because they are fairly similar, and I look across all the PRAs and

Figure 2.4.8
Graded QA Implementation Using PRA



note every important component within them, I still only come up with about 200 components.

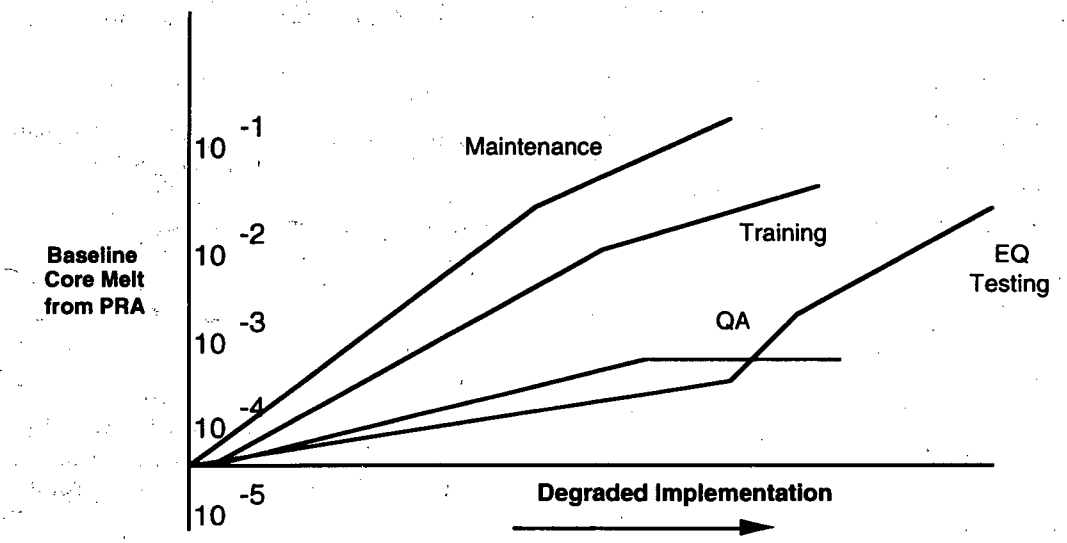
The Q-List includes items that are not important in any of the PRAs. Two classes thus arise from using risk insights. Let me suggest that the top class has to be as gold plated tomorrow as it is today. So I'm not destroying the structure I have. As far as the second class is concerned, there may be some room for negotiation, based on the fact that I can demonstrate that, not only is a given Q-List item not safety-significant at my plant, it is not safety-significant at any plant. This determination will gives us a sense of completeness in each PRA because we're not now unilaterally dependent on one licensees' approach.

Taking it a step further, if I have very detailed, plant-specific PRAs, I can introduce a middle class between the least and most important classes and have three classes in graded QA that require three different levels of procurement. I can integrate maintenance observations and periodic inspections with the pedigree that I have. If I perform a periodic survey, I should be able to have less of a pedigree because, periodically, I will catch a critical flaw. The PRA allows you to look across subject area boundaries.

Figure 2.4.9 shows a look across the regulations to see if we can find a way to measure their individual importance. If we take into account what a regulation contributes to a PRA, we will look at how each regulation contributes to multiple systems. We will compare each regulation against each system and assess how important it is among all other regulations to a given system. This is very subjective. Using that very subjective number we get a sensitivity curve, the slope of the curve indicates how important it is to comply with a particular rule. The slope of the curve flattens because, at some point, normal industrial practice is good enough. In fact, just the initial qualifications of equipment or personnel will cause the curve to flatten in a way that's very different from traditional assumptions. On the other hand, if I just crunched numbers in a sensitivity study, at some point, I would have a guaranteed core melt. What we're illustrating here is an approach that reflects what really happens out there.

In summary, it is important to identify problems specifically, so that we know exactly what it is we want to change. Specific solutions are easier to come by, if the statement of a problem is exact, be it one of process or paper.

Figure 2.4.9
Risk Significance of Regulatory Programs (Speculative)



Management Insights

- Many Areas for Improvement
- Staff Must Be and Will Be Receptive to Changes
- Don't Replace Prescriptive Rule with Prescriptive Guidance Documents
- Inspectors, Reviewers, Industry Staff Need New, Revised, Modified Guidance
- Utilities Have a Major Role in Causing Change
  - Identify Specific Problems
  - Identify Specific Solutions
  - Be Persistent

Frank Gillespie—slide 3.

And you in the industry need to be persistent. I think you already are seeing a change, as NRR has put a new group in to be responsive to the kind of problems we have discussed. Of course, responsiveness does not necessarily produce agreement. If I may recall something unpleasant from the past, SALP used to include responsiveness as a criterion. However, there was a tendency among some within the industry to interpret a point of view that conflicted with their own as non responsiveness on our part. When we removed that criterion from SALP, we took a first step toward a new way of doing business. The relationship between the NRC and the industry should not be adversarial. We have a professional relationship, based on mutual responsibilities. Within this relationship, we each need to better define our specific roles to better eliminate requirements marginal to safety.

2.5 Moni Dey
Nuclear Regulatory Commission

"Marginal to Safety" Program Scope, Schedules and Status

Good morning ladies and gentlemen. This morning, I will briefly go over the issues currently under consideration in the marginal to-safety program and that are the subjects of the sessions for this workshop. At this workshop, we seek public and industry input on these issues to determine specific modifications that can decrease regulatory burden with marginal impact on safety. Based on this input, we will adopt specific approaches and realign our priorities as necessary. As Jim Taylor mentioned, there are eight areas that we are currently actively working on that the Commission approved in August 1992. Several of the proposals are for modifying current requirements and practices to be more performance oriented or risk based, so let me cover those first.

Improving the Effectiveness of the Regulatory Process

- Decrease Prescriptiveness of Requirements
- Provide Flexibility to Licensees
- Implement Cost-Effective Safety Features
- Transition from Programmatic and Compliance Based to Performance-Oriented Approach
- *Stimulate Self-Initiative*

Moni Dey—slide 1

In early 1992, the NRC had proposed for public comment its conclusion that decreasing the prescriptiveness of some of its requirements may improve their effectiveness by providing flexibility to licensees. By decreasing the prescriptiveness of some requirements, and providing flexibility to the licensees for implementing cost-effective safety features, the regulatory process may also be made more efficient. Specifically the NRC proposed to amend requirements in three areas: (1) Containment Leakage Testing; (2) Fire Protection; and (3) Post-Accident Combustible Gas Control. These subjects are on the agenda for this workshop.

In response to NRC's proposals, the industry agreed that certain requirements could be improved in effectiveness by decreasing their prescriptiveness. Industry noted that, beyond the specific issue of prescriptiveness, further benefits to safety and reductions in burden could be accomplished through a transition from a programmatic and compliance based approach to one that is performance-oriented and risk based. Decreasing the prescriptiveness of requirements will allow licensees to determine how to meet performance requirements, which will stimulate self-initiative and overall result in a positive impact on safety. Furthermore, basing requirements on risk should help assure that less important requirements will not be overemphasized and

the overall effectiveness of requirements will be increased. These approaches should allow a focus on the results more important to safety and result in a more effective allocation of resources. Some commenters recommended that the NRC staff should address the issues that would arise in developing performance-based requirements, such as those relating to enforcement and consistent interpretation of requirements in the inspection process. Several commenters indicated that probabilistic risk assessment (PRA) results, and NRC's safety goal criteria should be used in modifying existing requirements and guidance.

Areas Proposed for Action by NRC

- Containment Leakage Testing
- Fire Protection
- Post-Accident Combustible Gas Control

Additional Suggested Areas

- Quality Assurance
- Environmental Qualification of Electrical Equipment
- Plant Security
- Requests for Information under 10CFR50.54(f)
- Post-Accident Sampling Systems

Moni Dey—slide 2

Industry groups and utilities indicated general agreement with the three areas proposed for action by the NRC that I mentioned earlier. In addition, requirements and implementation documents related to quality assurance and environmental qualification of electrical equipment were suggested as candidates for improved effectiveness by making them more performance oriented. These two topics are also on the agenda for this workshop.

Three other areas have been chosen for action based on the number of commenters that identified the area as a candidate for burden reduction with marginal impact on safety. These are requirements related to plant security, requests for information under 10 CFR50.54(f), and post-accident sampling systems. The first two subjects are on the agenda for this workshop. Due to time restrictions, we were not able to include PASS in the agenda, but we will take any comments on it at the concluding Summary Session, particularly if it is viewed as a priority item.

At this workshop the staff hopes to obtain specific proposals in these areas, and an indication as to which of these areas efforts would be most productive in terms of burden reduction with marginal impact on safety. This information will be used by the staff to adopt specific approaches and to prioritize our efforts.

Now let me briefly go over some concepts we published in the Federal Register to serve as a starting point for discussions at this workshop. They are also included in your workshop binders under the respective subjects. The staff informed the Commission of the conceptual framework I will describe shortly in SECY-93-028, dated February 5, 1993. You can find a discussion in that SECY also.

Framework for Performance-Based Regulatory Approach

- Allow Licensees Flexibility to Use Cost-Effective Methods
- Establish Regulatory Safety Objective from Risk Considerations
- Encourage Industry Standards and Guidance Documents for Implementation of Regulatory Objectives
- Maintain Standardized Industry Practices
- Allow Voluntary Adoption of New Regulations
- Address Body of Regulatory Practices in Adopting Approaches
- Provide Incentive for Innovation in Technology and Safety

Moni Dey—slide 3

Firstly, let me cover preliminary criteria or ground rules we would use to guide us in adopting performance-based regulatory approaches. These are:

1. The main aim of a performance-based regulatory approach is to allow licensees flexibility to use cost-effective methods for implementation of the objectives. Revised requirements should focus on establishing the regulatory safety

objective in as an objective manner as possible.

2. The regulatory objective should be derived, to the extent feasible, from risk considerations and relationship to safety goals.

3. Detailed technical methods for measuring or judging the acceptability of licensee's performance relative to the regulatory objectives should, to the extent possible, be provided in industry standards and guidance documents, which could be endorsed in Regulatory Guides.

4. To maintain standardized industry practices, collective industry efforts through organizations such as NUMARC, owner's groups and professional societies are needed.

5. New regulations formulated to allow flexibility for implementation to licensees will be for current licensees and thus licensees can decide to remain in compliance with current regulations.

6. The scope of the effort to adopt performance-based regulatory approaches will not be limited to regulations, but will address the body of regulatory practice, for example, the Standard Review Plan, inspection procedures, technical specifications, and other regulatory documents.

7. Performance-based regulatory approaches should be formulated to provide incentives for innovation and improvements in technology and safety.

Issues to be Addressed

- Can New Approaches Yield Only Marginal Impact on Safety?
- Will Regulatory Safety Objective Allow Common Understanding between Licensees and NRC?
- Can New Regulation and/or Implementation Documents Be Objectively Inspected and Enforced Against?

Moni Dey—slide 4

As I mentioned earlier, some issues have already been identified relative to the development of performance-based regulations that need to be addressed in the process:

1. Can the revised rule and its implementation yield an equivalent level of, or only have a marginal impact on, safety?

2. Can a qualitative or quantitative regulatory safety objective be established in an objective manner to allow a common understanding between licensees and the NRC on how the performance or results will be measured or judged?

3. Can the regulation and implementation documents be developed in such a manner that they can be objectively and consistently inspected and enforced against?

The first panel session is aimed at seeking your input on the framework or ground rules we would use in adopting performance-based and risk-based regulatory approaches.

Now I will briefly go over one potential specific application of a performance-based regulatory approach for containment leakage testing that the NRC published earlier. Your workshop folder contains two other examples on fire protection and post-accident combustible gas control which you may wish to refer to during the sessions on those subjects.

Appendix J to 10CFR Part 50, entitled "Primary Reactor Containment Leakage Testing for Water-Cooled Power Reactors," has been identified as a prescriptive regulation which contains detailed requirements for containment leakage testing and reporting of the results of those tests. The Commission approved, in August 1992, staff plans to initiate rulemaking to modify and make less prescriptive and more performance-oriented this regulation, along with two others, in order to decrease regulatory burden with marginal impact on safety. The Commission also approved the staff's plan to relax the allowable containment leakage rate utilized to define performance standards for containment tests.

Modifying Containment Leakage Testing Requirements

- Make Appendix J Less Prescriptive and More Performance Oriented
- Relax Allowable Containment Leakage Rate Based on Risk Considerations
- Establish Frequency of Containment Tests Based on Risk-Based Criteria
- Evaluate Benefits of on-Line Monitoring of Containment Isolation Status
- Move Details of Tests in Appendix J to a Regulatory Guide as Guidance
- Allow Voluntary Adoption of New Regulation

Moni Dey—slide 5

The primary regulatory safety objective in this area is clearly containment integrity. Present information of risk from postulated accidents indicate that the allowable leakage rate from containments can be increased, and that control of containment leakage at a low rate is not as risk significant as previously assumed. Reliability and availability of containment integrity are also important factors. The staff is currently assessing the latest information from risk assessment studies and plans to establish, based on risk considerations, a new performance standard for the allowable leakage rate through rulemaking.

Containment leakage tests are conducted to confirm and provide confidence in the performance of the containment during postulated accidents, and they indirectly reduce risk based on these assumptions. Quantifying the risk benefits of these tests is a more difficult task, however, we are attempting to establish a performance standard, based on risk considerations, that could be utilized to determine the appropriate frequency and type of containment tests. We are also evaluating on-line monitoring of containment isolation status and the risk trade-offs between on-line monitoring and periodic containment testing.

Consistent with the framework I outlined earlier, our preliminary approach is to move the details of the tests and reporting in Appendix J to a Regulatory Guide as guidance. Current detailed requirements in Appendix J will continue to be acceptable for compliance with the modified rule, i.e., licensees presently in compliance with Appendix J will not need to do anything if they do not wish to change their practices. The staff is soliciting the development of industry standards that would provide guidance on implementation methods for the performance standards contained in the new regulation.

We are vigorously pursuing developments in this area. Our intent is to use the Appendix J rulemaking activity as a pilot to flesh out the concepts, approaches, and policy issues. We will then have an example of how things can be done.

In terms of schedule, the staff plans to submit to the Commission proposed modifications to regulations and/or implementation guidance documents in three areas by the end of March 1994.

I have provided here a description of some of our efforts and initial thinking. We are, of course, at an early stage in the process. That's why we are having this workshop, to seek your innovative and specific ideas so that we can work together towards continuing to improve the effectiveness and efficiency of the regulatory process. I look forward to hearing your ideas and comments.

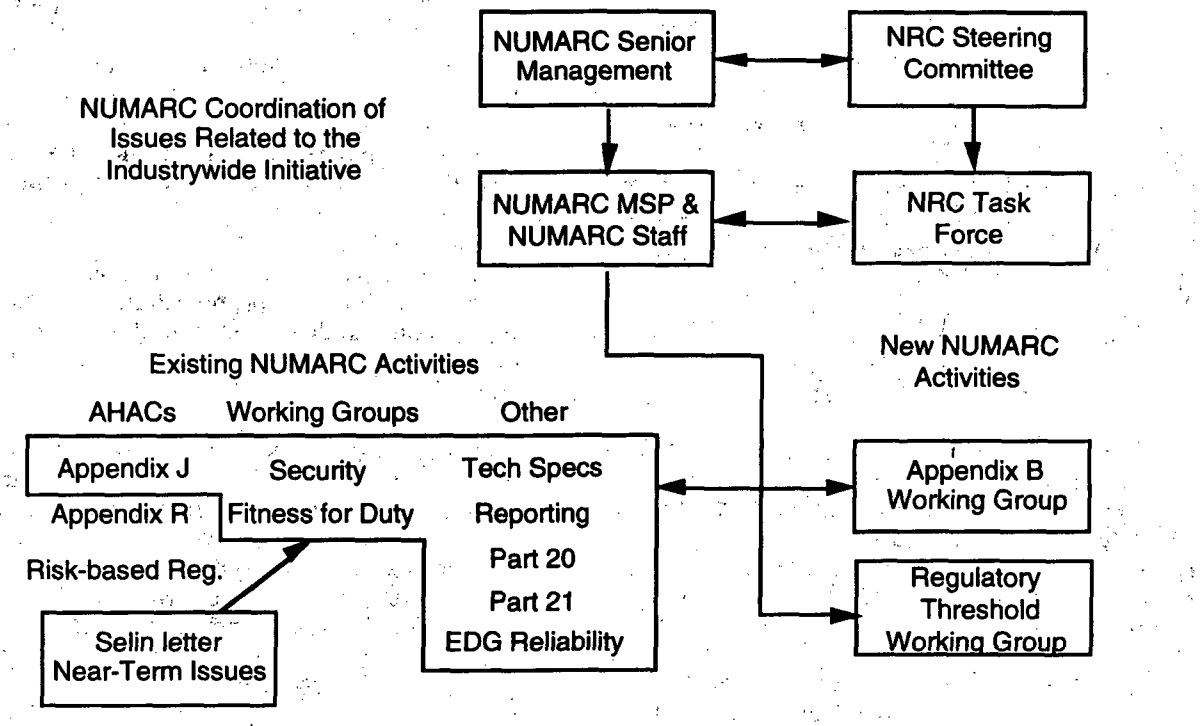
2.6 Stephen Floyd
NUMARC

We're pleased that the NRC is looking at requirements that are marginal to safety and identifying where inflexibility in regulatory requirements prohibits the application of more cost-effective approaches to meet the intended safety benefit of regulatory requirements. We believe that the elimination of marginal or needlessly prescriptive requirements can, in fact, enhance overall plant safety by allowing management and staff to focus on more important issues.

Our resources are not unlimited and must be used wisely to achieve a proper balance between plant operational efficiency and overall plant safety. This ability to use our resources judiciously is paramount to producing electricity in a safe and economical manner.

The industry has embarked on a comprehensive initiative to reduce nuclear generation costs while ensuring high levels of

Figure 2.6.1



safety. The initiative can be broken down into three basic actions:

- Actions to improve the operational cost-effectiveness of power plants. This means focusing on what we can do as an industry to improve the way that we conduct business.
- Actions to improve industry interactions with the external environment.
- Actions to improve regulations.

With respect to the third initiative, I would like to briefly sketch the organizational structure that NUMARC has put in place. (See Figure 2.6.1)

Ad hoc advisory committees have been working on Appendix J, Appendix R, and risk-based regulation. We have some formal working groups (which are higher level committees) acting in the areas of security and fitness for duty. Significant NUMARC staff resources are also put to use.

Industrywide Initiative

- A Comprehensive Initiative to Reduce Nuclear Generation Costs While Assuring High Levels of Safety
- Three Major Focus Areas
  - Actions to Improve Operational Effectiveness of Power Plants
  - Actions to Improve Industry Interactions with the External Environment
  - Actions to Improve Regulations and Regulatory Processes
- Industry Coordination of Third Focus Area of Industrywide Initiative

Stephen D. Floyd—slide 1

We formed an Appendix B Working Group recently whose primary function is to recommend revised implementation practices for Appendix B. The group is expected to work closely with the other working group we

formed recently—the Regulatory Threshold Working Group.—because we also believe that the quality assurance (Appendix B) area is ripe for some risk-based applications. The concept certainly needs to be evaluated.

The Regulatory Threshold Working Group has as its objectives to look at the Safety Goal Policy and how it might be implemented. The group will make recommendations on implementing the policy through the regulatory process, establish ground rules for PRA applications in regulations, and look at potential applications of risk- and performance-based approaches to regulations.

Need for Near-Term Action

- December 21, 1992, Letter to Commission
  - Immediate Actions Possible (near-term)
    - Fitness-for-Duty
    - Security
    - EDG Reliability
    - Radiation Protection
    - Routine/Periodic Reports to NRC
    - Containment Leak Rate Testing
    - Dedication of Commercial Grade Items
    - Adoption of Improved Standard Tech Specs
  - Expedited Actions to Effect Positive Change (longer term)
    - Independent Spent Fuel Storage Installations
    - Regulations Marginal to Safety
    - Regulatory Threshold
    - SALP
- Issues Common to NRC's Program for Elimination of Requirements Marginal to Safety
  - Containment Leakage and Testing Requirements
  - Requirements for Physical Protection for Power Reactors
  - Regulatory Threshold
- Recommend Focusing NRC and Industry Resources on Common Areas First

Stephen D. Floyd—slide 2

In our letter of December 21st to the Commission, we identified eight immediate action issues we believe can be resolved in the very near term. A tremendous amount of study, analysis, and supporting documentation exists for us to conclude that we really have enough information on these issues to resolve them now. We have since identified four more issues.

Among the issues we proposed for resolution in our December 21st letter are three that surfaced among the topics of this workshop. They are containment leakage testing requirements, requirements for physical protection of power reactors, and the framework for a performance-based regulatory approach.

We propose to focus NRC and industry resources on these areas of common interest first. This is because we believe strongly that we need to achieve some early results to confirm our sincerity and mutual resolve to continue this important endeavor.

We also would like to hear from members of the industry throughout this conference on how they would like to see the issues prioritized. If you have another focus area that you think is more important, we at NUMARC would like to know it.

Need for Continued Management Involvement

- Industry Committed to Industrywide Initiative
- Encourage Continued NRC Senior Management Attention

Stephen D. Floyd—slide 3

In summary, the industry is committed to work in a coordinated manner to simplify the regulatory process in a responsible way. We encourage continued NRC senior management attention in seeking the flexibility needed to optimize plant efficiency and plant safety. We have been very pleased to hear during this conference the NRC speak of its dedication to effect change in the regulatory process.

To this end, we recommend establishment of a senior team, or senior NRC management review board, to ensure that issues identified as needing resolution are addressed and resolved in a timely manner.

3. Framework for a Performance-Based Regulatory Approach

3.1 Jack Heltemes
Nuclear Regulatory Commission

Good morning. I am Jack Heltemes. I'm the Deputy Director of the Office of Research for Generic Issue and Rulemaking. I want to welcome you to this session on performance based regulatory approach.

As you know the Commission has placed a high priority on assuring that NRC regulations are efficient. I think that Frank Gillespie covered that today and I think you heard it from the Chairman and the EDO directly.

We are also obligated to pursue all options that hold the promise of minimizing the use of resources. And thus, that's why the NRC has a high interest in performance-based regulation.

With performance-based regulations the regulatory objectives are not changed. They remain the same. But the promise is that with increased flexibility the effectiveness and the efficiency of the regulations will go up, and that the regulatory objectives can be obtained at lower cost.

Performance-Based Regulatory Approach

Why Performance-Based

- Decreasing the prescriptiveness of some regulations may improve their effectiveness by providing flexibility to licensees without reducing safety.
- Requiring resources to be spent on activities not important to safety may reduce resources on items important to safety and thus overall plant safety.

Jack Heltemes—slide 1

In order to help set the stage for today's discussion let me provide you with some overview on the concept and features of performance-based and prescriptive regulatory approaches.

In the Federal Register Notice of February 4th, 1992, which requested public comment on the elimination requirements marginal to safety program there was a conclusion. The conclusion was that decreasing the prescriptiveness of some regulations may improve their effectiveness by providing flexibility to licensees without reducing safety. The premise or principle underlying this conclusion was that resources are not unlimited, they are finite and thus if the NRC regulations require resources to be spent on activities and items not important to safety, they are likely to draw attention and resources away from those components and activities that are important to safety and thus from plant safety.

Approaches to Regulation

- Prescriptive Regulations
  - Focus on "Means"
  - Specifies How Things Are Done
  - Downplays the "End" Itself
  - Detailed Guidance Developed (RG-SRP)
  - Inspection and Enforcement Uses Guidance
- Performance-Based Regulations
  - Focus on "Ends"
  - Specifies How Things Are Judged
  - Downplays "How" the End Is Accomplished
  - Regulations Specify Approach or Goals
  - Enforcement Action If Goals Not Met

Jack Heltemes—slide 2

There are two basic approaches to regulation (see slide two). The first often used in the past is called prescriptive and the other nonprescriptive or performance-based. Prescriptive regulations really focus on the means, how something is accomplished to the end itself. What are the desired results of the accomplishment generally is downplayed and not well specified.

Oftentimes in specifying how things are done the Commission would specify a certain program needs to be implemented or a process to be implemented. Oftentimes there's a rule—there will be a rule and then a regulatory guide giving one or more acceptable methods

of implementation and that guidance then would be used during inspection and enforcement.

Normally what happens is the program implementation is audited against the regulatory guide and the regulations. In performance-based regulation the focus is on the ends. What are the objectives to be achieved? What type of acceptable results does the Commission feel is necessary. The regulation or the regulatory guide has to specify those acceptable results and also how they will be monitored or how they will be judged. How it will be accomplished is downplayed and generally not specified and therefore there is great flexibility in how to bring about the regulatory objectives.

The regulations will specify the approach, the expected results, and performance-based regulations are indeed regulations and have to be able to be to enforced or the expected results are not obtained. And so enforcement and consistency in enforcement becomes a critical question.

Prescriptive Regulation

- Past NRC Practice Has Involved Prescriptive Approaches
  - Regulatory Guide Specifies an Acceptable Approach
  - Burden on Licensees to Show Another Approach is Acceptable
- Offers Certain Advantages
  - Generally Straightforward
  - Less Susceptible to Misinterpretation
  - May Involve Less NRC Effort Due to Uniform Approach
  - Easier to Specify
  - May Serve to Narrow the Scope of Review or Hearing
- Has a Number of Disadvantages
  - Minimal Flexibility in Implementation
  - Does Not Account for Plant-Specific Factors
  - Inhibits Innovation by Licensees
  - Tends to Shift Focus Away from Desired Result

Jack Heltemes—slide 3

Now, let's go through quickly the prescriptive regulations. As I mentioned, oftentimes there's a regulatory guide that specifies an acceptable implementation approach or more than one acceptable implementation approach.

If the licensee, however, wishes to use a different approach or a different method the burden is on the licensee to develop that method and then to justify to the NRC as equal or acceptable in terms of its justification.

This approach offers a number of advantages. It's generally very straightforward. It's well understood by licensees in the NRC. As a result it's generally less susceptible to misinterpretation by licensees or to result in a contested finding of noncompliance during NRC inspections.

The prescriptive approach is a generic approach. It's a sort of a one-size-fits-all approach and therefore it's generally easier for the NRC to specify one acceptable method. It generally involves less NRC resources to develop the approach or to implement the approach. And since it's well understood and the criteria are well specified for what will be done, oftentimes the prescriptive approach can serve to limit the scope of a review or a hearing and it has that advantage. But it also has a number of disadvantages. As soon as you specify well the exact method of implementation there is not flexibility to licensees in how they implement the regulatory guide or regulation. And as a result it does not account for plant-specific or license-specific factors. And as a result it inhibits innovation in trying to come up with new methods for the effective use of resources.

It tends to shift the focus and perhaps the resources away from what is trying to be accomplished to how it's being accomplished. It places the focus on the implementation. The critical question with prescriptive regulations is the efficiency in terms of the use of resources by allowing greater flexibility by allowing to account for licensees or site-specific factors. It's thought that we can increase the effective use of resources through the nonprescriptive or the performance-based regulation.

The key to performance-based regulations (slide 4) are that the objectives are clear and that these objectives can be measured and enforced with reasonable consistency. This approach has a number of advantages. It provides a direct focus on what is to be achieved. What are the acceptable results that the Commission feels are necessary? It provides wide latitude of flexibility for licensees to come up with how those results are

to be obtained. And as a result it promotes innovation in trying to come up with methods and approaches that will make the maximum use of resources. It accounts for licensees and site-specific factors.

Performance-Based Regulation

- Based on Objectives That Are Clear and Can Be Measured and Enforced with Reasonable Consistency
- Does Not Prescribe How the Objectives or Intended Results Are to Be Achieved
- Has a Number of Benefits
  - Direct Focus on What Is to Be Achieved
  - Wide Latitude for Licensee to Define How to Accomplish
  - Promotes Innovations and Effective Use of Resources
  - Accounts for Site-Specific Factors
- Potential Problem Areas
  - Results May Be Susceptible to Differing Interpretations
  - Revised NRC Inspection Practices and Training Necessary
  - May Not Be Applicable for All Regulatory Situations

Jack Heltemes—slide 4

But there are some potential problem areas. First of all, the results may be susceptible to differing interpretation. The absolute key to performance-based regulation is a common understanding that has to be developed between the NRC licensees and the public as to what is the acceptable range of results and how will they be monitored and judged.

The NRC recognizes with performance-based regulations that there will have to be differences in how we approach inspection practices and enforcement. For example, and I'll get to it in a moment, the maintenance rule. We now are developing guidance for the maintenance rule and then the emphasis will shift with a high priority to develop the inspection guidance, the inspection approach and enforcement policy with regard to the maintenance rule. We can talk more about that.

Approach for Maintenance

- Prescriptive
  1. Implement a Maintenance Program That Addresses:
     - Corrective, Preventive, Predictive Maintenance
     - Engineering Support
     - Quality Assurance
     - Plant Modifications
     - Equipment History and Trending
     - Record Keeping
     - Maintenance of Parts, Tools, and Facilities
     - Procedures
     - Post-Maintenance Testing
     - Personnel Qualification and Training
     - Vendor Recommendations
     - Radiological Exposure Control
     - Control of Contractors
  2. Regularly Assess Effectiveness - Implement Corrective Action
- Performance-Based
  1. Monitor Performance or Condition of Structures, Systems or Components Against Licensee Established Goals
  2. Provide Reasonable Assurance That Such Structures, Systems and Components Are Capable of Fulfilling Their Intended Functions
  3. When Goals Are Not Met, Corrective Action Shall Be Taken
  4. Perform Annual Assessment and Make Adjustments as Necessary

Jack Heltemes—slide 5

I think Frank Gillespie talked to you about the principles for good regulations that the Commission has published. If you read those you will see that there is a commitment by the agency to assure that all NRC regulations are clear, that they're logical, that they're practical and they're coherent. There is a commitment that the NRC's policies and its positions are readily understood by all licensees. And thus, in the case of performance-based regulation if you can't meet those types of criteria, then performance based regulation may not be applicable to all regulatory situations and we may have to fall back to prescriptive.

One example of the performance-based regulation is the maintenance rule. The proposed rule that was published for public comment was prescriptive in nature. The Commission and the staff proposed that all licensees have a maintenance program that addressed 13 different areas or elements of

maintenance and there was a regulatory guide published about the same period of time that gave clarifying guidance, additional guidance on each of these 13 areas and they're listed on slide 5.

However, the final maintenance rule was performance-based. It's to be effective July 10, 1996. It's a very simple rule. It says that all structures, systems and components within the scope of the maintenance rule are all safety-related structure, systems and components. All non safety-related structure, systems and components that could prevent a safety-related system or component from fulfilling its safety function and some key equipment that are specified in the EOPs that you must establish goals or criteria for the equipment within its scope and then you monitor the performance or the condition of these structure, systems and components against those criteria or goals to assure that equipment is capable of fulfilling their safety function. When the goals are not met, then you have to take corrective action.

The rule now specifies that an annual assessment of the maintenance program needs to take place and any adjustments in the program should be made based on the results obtained. There is a rulemaking now in progress to change the annual assessment to once every refueling cycle or 24 months whatever is shorter.

Now, it's understood that for the maintenance rule some additional guidance was necessary and NUMARC provided the leadership to develop that guidance. That guidance has been reviewed by the NRC and found to be acceptable and we are in the process now of endorsing that guidance by regulatory guide.

This is a quick once-through on performance-based and prescriptive-type regulations. Now, what I would like to do is move to hear from each of our panel members and then move to your questions and comments.

3.2 Martin L. Bowling
Virginia Power

Framework for Performance-Based Regulation

On behalf of Virginia Power, I would like to commend the NRC for the initiative they have undertaken and that Virginia Power is fully supporting.

Present Regulatory Approach

- Deterministic in Formulation
- Typically Issue Driven and Issue Specific
- Sometimes Reinterpreted During Inspections
- Examples
  - Station Blackout (10CFR50.63)
  - Emergency Diesel Generator Reliability (GI B-56)
  - Emergency Preparedness Annual Drill (10CFR50 APP E)
  - Reduced Inventory Operation (GL 88-17)

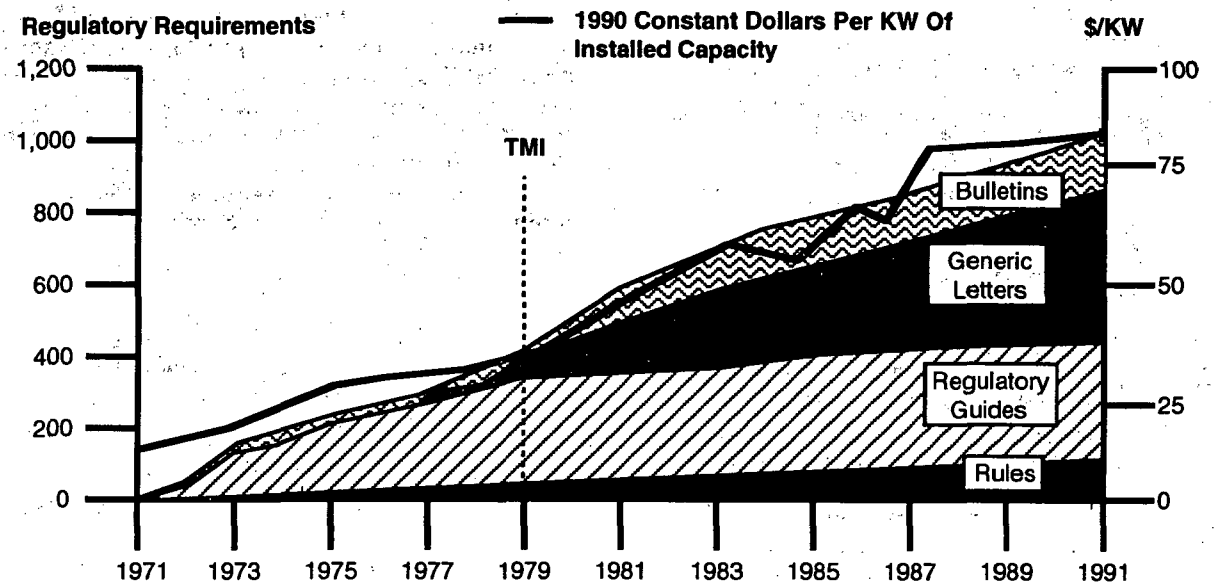
Martin L. Bowling—slide 1

I think it's very clear that regulation to date has been deterministic in its basis. It's primarily issue-dependent or issue-specific, taking care of one direct problem. I've listed a number of examples that should be familiar to all of you. I selected these not only for their cost, but their prescriptiveness and the fact that some of them are still in the development stage, that is, under rulemaking consideration.

One area that hasn't been touched on directly this morning has to do with interpretation of regulation and implementing documents primarily at the inspection level. I encourage the NRC to ensure that the region inspectors are fully informed of the process now being undertaken because a lot of the interpretation takes place at their level.

I would say that regulation has served us well and, from a nuclear safety standpoint, the industry has benefited from it. So I think it's a legitimate question to ask why we should change the process. I will try to offer at least three possible reasons for why we need to change now.

Figure 3.2.1
Cumulative NRC Regulatory Requirements Comparison to Nuclear Industry O&M Costs



Source: Costs—NUMARC (UDI/USCEA)
Regulatory Requirements—INPO

Why Change?

- Industry Operating and Safety Performance Has Substantially Improved over the Last Decade Primarily by Establishing and Achieving Performance Based Goals
- Performance and Risk Based Evaluation Can Typically Achieve the Desired Level of Safety at Lower Cost
- Better Recognition of Different Plant Designs, Locations and Operating Practices

Martin L. Bowling—slide 2

First of all, there's been a tremendous amount of progress in nuclear reactor licensee performance over the past decade and particularly in the last five to six years. I think the reason for this, primarily, is that we've adopted performance-based standards, as opposed to maintaining the prescriptive, minimal-requirement approach. As a result of setting high standards and in meeting—and, in many cases, exceeding—those standards, the performance of the industry as a whole has never been better or safer.

However, it's clear that prescriptive regulations have led to even higher operating and maintaining costs, and that the industry is just not in a position to continue to expend at that level into the indefinite future.

I've borrowed Figure 3.2.1 from a NUMARC report, which shows the amount of regulation that has occurred over the last decade and tries to relate that to the cost. If you remember back to the point that Frank Gillespie made, there are just not that many rules, as this slide shows. The problem is from a cost standpoint, which has to do with the implementation documents—of which there have been a plethora over the years—and as I indicated earlier, with the interpretation of those implementing requirements, particularly at the region level.

One other reason why we need to change is to recognize and take advantage of specific utility situations, locations, type of operating

practices, and other unique design features. The prescriptive nature of regulations that cover everybody is overkill for certain utilities.

Framework for Performance Based Regulation

- Should Be Integrated into the Regulatory Process
- Combination of Approaches Necessary to Overall Plant Safety and Performance
  - Deterministic
  - Performance Based
  - Risk Based
- Requirements Proportionally Applied Provide Adequate Safety
- Examples
  - Safety Related Definition
  - Station Blackout and EDG Reliability
  - Emergency Planning
  - Reduced Inventory Operation

Martin L. Bowling—slide 3

As far as a framework, it's pretty consistent with what you've already heard. I think a performance basis is not a stand-alone approach to regulation. It needs to be integrated into the process and we need a mixture of deterministic, risk-based and performance-based regulation with the flexibility to respond to a specific case.

I would like to talk about one example that I think is particularly important. Frank Gillespie mentioned it in his discussion.

Safety Related Definition

- "those structures, systems and components relied upon to fulfill the three basic safety functions of assuring 1) *the integrity of the reactor coolant pressure boundary* 2) the capability to shut down the reactor and maintain safe shutdown 3) the capability to prevent of mitigate the consequences of accidents which could result in offsite exposure."
- 60,000 - 100,000 Components Defined "Safety Related
- Based on identification of components that have impact on the core damage frequency (cdf)
- Only 2% of Components Presently Considered "Safety Related" Impact CDF

Martin L. Bowling—slide 4

Slide 4 shows the definition of "safety-related" from Part 100. I'm sure it's familiar to you. Over the years, the interpretation of these words has resulted in Q-Lists that approach, in some cases, 100,000 items. Now, these items are all treated under the safety-related definition when, in fact, from a risk-based standpoint, there are significantly fewer components that are important to reactor safety. We estimate that something on the order of two percent of what we're currently treating as safety-related would provide more than adequate assurances of nuclear safety. The reason this is so important is that this is a major operating and maintenance cost-driving function.

Increased Requirements and Costs Associated with a "Safety-Related" Classification

- Increased Cost and Complexity of Procurements
- Increased Vendor Surveillance
- Longer Lead Times for Delivery
- Increased Storage Costs (Shelf Life, Segregation, etc.)
- More Complex Installation Procedures (QA Hold Points, etc.)
- Increased and More Complex Surveillance Testing
- More Complex Maintenance Procedures and Requirements

Martin L. Bowling—slide 5

This cost-driving function crosses all of the boundaries and organizations and processes that we use to operate and maintain nuclear plants. From procurement to operations to maintenance, these costs are there because we are treating as safety-related many more items than we need to in many cases. So certainly Virginia Power would encourage the NRC to continue this look at risk-based regulation, particularly to reassess the definition of safety-related.

There was a lot of discussion this morning about NRC process, and that's good. But if you looked at the sources of regulation over the last ten years on the NUMARC slide, most of the regulatory burden, if you will, and the costs associated with that burden are in the implementing documents.

Many of these implementing documents have been committed to by the licensees, but to change or license amendments doesn't require detailed rulemaking. It does require interaction with staff and in some cases there is a need for concurrence. But making these changes is relatively straightforward from a regulatory process standpoint.

For that reason, in our efforts to reduce marginal safety requirements, we at Virginia Power focused on the commitment end more than on rulemaking.

Virginia Power Initiative for Elimination of Requirements Marginal to Safety

- Identify and Assess Potential Requirements
- Submit Site Specific Changes to NRC
  - Commitment Changes
  - Technical Specification Changes
  - Exemption Requests
- Propose Generic Rulemaking
- Coordinate Effort with NUMARC

Martin L. Bowling—slide 6

In Slide 6, there's a list of items that we have submitted to the Commission over the last six months for regulatory reduction. In each case, these are items that we feel are an undue cost for the safety benefit gained, or that no safety benefit is provided.

In some instances, I've indicated the cost savings associated with reducing an item's safety-related status, and I am pleased to inform you that the Commission has been acting on these requests in a positive way. Several of them have already been approved. Others are actively being reviewed. But the emphasis is on commitments that we have made and are easier to change than is the rulemaking process.

To summarize, I think we need to go to a regulatory process that protects the health and safety of the public, and at the same time minimizes the cost to the licensees.

Conclusion

- Need a Regulatory Process Which Will Maintain a High Assurance of Public Health and Safety While Minimizing Regulatory Burden and Costs
- A More Flexible Regulatory Process Would Combine
  - Risk-Based Criteria
  - Performance Based Experience
  - *Deterministic Specified Requirements When* Justified by High Risk and/or Low Performance

Martin L. Bowling—slide 7

I think the best approach is to integrate into the current process risk-based and performance-based regulation and to apply each on a case-by-case basis.

3.3 Dan Stenger
Winston and Strawn

As this workshop clearly indicates, the NRC has begun to heed the call from licensees for greater flexibility in the regulatory process. Nonprescriptive regulation in the form of performance-based or risk-based regulation is an idea whose time has come.

New regulations are likely to be performance-oriented. The recent maintenance rule is a performance-based regulation, for example. This workshop itself may indicate a need to reassess the validity of some current prescriptive regulations, such as Appendix R and Appendix J. On the inspection and enforcement front, it is probable that the NRC will continue to inspect licensee programs and systems where there are no detailed acceptance criteria, as in service water inspections and EDS inspections.

In discussing some of the legal implications of the move from prescriptive to performance-based regulation, let me note that we are moving toward a new way of regulating; toward something we haven't had specifically in this form before. This is not to say that performance-based regulation is completely uncharted, but there are pitfalls and legal considerations to be borne in mind as performance regulation evolves.

First of all, moving to performance-based standards does create a potential for ever-increasing standards. We lawyers like to think

in terms of the certainty that comes from definite black-and-white regulatory requirements.

With prescriptive requirements, there is some advantage. Theoretically, it is possible to know when you are in compliance and when you are not. It's not always clear, but theoretically it should be. With performance-based regulation, subjectivity is involved in assessing compliance, which may lead to a dilemma. How can I be sure that my actions are adequate to meet the performance-based regulation, or, more important, to meet the inspector's view of what is adequate to meet the regulatory standard?

In addition, as performance among licensees improves, there will be a natural tendency on the part of some regulators to expect all licensees to move up to the highest level of performance. If acceptable performance standards are not clearly and definitely laid down, the subjective nature of performance-based regulation could present a problem in terms of unacknowledged backfitting of plants to ever-increasing standards.

Now, I don't mean to suggest that the laudable idea of performance-based regulation should be abandoned because of these risks. I only want to point out some concerns that should be borne in mind as nonprescriptive regulation evolves. To my mind, these concerns can be resolved if a balance is struck between the need licensees have for flexibility and their need for certainty. I have no doubt that the NRC, working with the industry, will be able to achieve that balance.

The second issue I raise is how to effect the transfer to nonprescriptive regulation without throwing existing licensee programs into a cocked hat. This may be of most relevance to workshop participants today, who are concerned with ways to improve some existing prescriptive regulations, such as Appendix J and Appendix R.

The point I want to emphasize is that, if we adopt changes to existing regulations to make them more performance-based, the impact on licensees and their current programs should be minimized. There are two ways to do this.

First, when a regulation is revised to make it more performance-based, the revision could be adopted as an alternative that does not supersede the existing regulation. Implementation of the revised regulation would be voluntary. Licensees who do not wish to move to the performance-based version of the regulation could maintain their existing programs in conformance with the more prescriptive version.

The NRC took that approach when they adopted the realistic Appendix K model, which was developed as an alternative to the original model. Licensees were able to use the revised model on a voluntary basis. I'm not suggesting that this is the sole answer, but it is one approach that can work, and its use precludes the problem of whether a new regulation needs to be justified under the backfitting rule. If a new regulation is solely for voluntary implementation, it should not be considered a backfit.

As a second approach, it may be possible for the NRC to make an explicit finding that current licensee programs that meet existing regulations will also satisfy the new performance-based regulations without the licensees having to take any additional action. Such licensee programs would be protected or grandfathered from new requirements.

Of course, the level of detail that exists in a prescriptive regulation now might be moved to a regulatory guide. I think there have been some calls to do that with Appendix R. Acceptable means of compliance with a performance-based standard could be set out in a regulatory guide, based on the current regulation. Again, that would minimize the impact on licensee programs; it would not necessarily require any changes in existing programs.

As so often is the case, the devil is in the details. What I've done here is sketch some of the legal and backfitting implications associated with a move toward a new standard, and suggest that these be borne in mind as we move to a performance-based process.

3.4 Neill Howey
Illinois Department of Nuclear Safety

Performance-Based Regulations

The idea of establishing goals, attempting to meet them, and adjusting behavior when the goals are not met makes sense. Reevaluating

the goals periodically to make sure that they are realistic also makes sense. Businesses do this all the time. In a competitive environment, those that don't, don't survive or do poorly.

When licensees have the factual information to establish performance goals, when they have the facts about risks that exist at their plants, and when their organizations can and will implement programs based on performance, then they also have the bases to operate in a performance-based regulatory environment. Paradoxically, these are the licensees for whom a rule is least necessary.

Performance-based regulations make sense where the basis of a planned design is known, where safety risks are known to exist in the design and operation of the plant, and where an organizational culture can operate within the flexibility of a performance-based regulatory environment. These conditions can be ensured before new plants are licensed and, for this reason, I think performance-based regulations make sense for the next generation of standard design plants.

I don't oppose performance-based regulations as a concept, but I have a lot of questions about how they might be applied in practice. I don't see them being implemented in today's environment without a loss of emphasis on safety, an emphasis that has taken many years to establish. I hope this workshop will answer some of the questions about performance-based regulations that I have.

To illustrate one of my questions, let me refer to the performance-based maintenance rule. Maintenance is one of those things that is basic to operating a power plant. Every plant must receive maintenance or the plant will only run for so long. So why does a regulator need a rule to tell the regulated they have to do something so basic as maintenance?

The regulator must have seen some licensees not doing a good job maintaining their plants and thought this might have an impact on safety. A need for a rule was perceived, as there was none in place to tell the regulated to do maintenance.

How do you write a rule prescriptive enough to cover all aspects of a topic as broad as nuclear power plant maintenance? You don't.

The industry saw the danger coming early on and tried to intercept it. The fact that this workshop has gone on today and NUMARC is so well represented just exemplifies that fact.

If all licensees are already doing maintenance satisfactorily, a performance-based rule, which proves that they are, is adequate. If the poor performers wanted to do satisfactory maintenance, they already would be, which means they think that what they're doing already is satisfactory. The regulator thinks some change of behavior is warranted in these cases; hence the need for a rule. Otherwise, the regulator has no teeth.

If licensee performance goals are established too broadly, a regulation may cause the poor performers to do even more poorly than before, in which case, we're better off without a rule at all.

How will a regulator evaluate maintenance programs? From what I've read, the maintenance programs will not be evaluated in detail against established criteria. Each licensee will be able to establish whatever program works individually. This affords much flexibility, and that's appealing to almost everyone.

The adequacy of each maintenance program will be judged based on whether a licensee's performance goals are met or not. This is a great idea for good performers with measurable goals. It is not so great for those the rule was written for in the first place, if the goals set do not cause maintenance programs to improve.

I like to draw an analogy to automobile maintenance when people call up my agency and ask me how some things could've occurred that I don't quite understand myself. I tell them you can have a poor maintenance program for your car, and yet it may run for years and years, meeting every performance goal you set for it. Until, one night, it strands you on a dark road and you get mugged because you didn't include checking your fan belts in your maintenance program, and nobody checked up on you to make sure that you did.

My agency is in the emergency response and preventive reactor safety business. It bothers me that a piece of safety equipment has to degrade or fail before it is included in the

statistics on whether performance goals are met or not. Safety equipment only runs occasionally, or when tested, but it only has to fail once at the wrong time to cause serious problems.

If a performance-based framework is adopted, will the equipment have to fail several times before a maintenance program is considered inadequate, or will the goals be adjusted downward?

If four attempts are needed to troubleshoot and fix an important-to-safety component before it finally gets fixed, is this counted as four failures, or only one when it comes time to evaluate the maintenance program and determine if performance goals were met or not?

If a worker cross-connects a water and air hose and fills a generator up with water, does this show an inadequate maintenance program that has implications for safety-related equipment, too?

If the regulatory and performance goals are established with safety in mind, I don't see how the requirement to use the best possible safety information can be avoided. This information is included in the individual plant examinations.

In the rulemaking on selecting systems, structures, and components important to maintenance, the NRC did not require the use of PRA information, but said it was an option. One of the reasons that the absolute numbers for core damage frequency in a PRA cannot be relied on as gospel is because the data used for calculating component failure rates can be unreliable. Unless failure rate assumptions used across PRAs are consistent, using absolute numbers to compare plant risk is invalid. It's the relative numbers that are important, both within and between PRAs.

A similar requirement for accurate reliability data will be needed to establish equipment performance goals as part of the performance-based regulatory approach. Therefore, a reliable means to measure component failure rates must be established to accurately measure risk in a PRA and to also measure performance goals in compliance with the maintenance rule; that is, if the two are to be linked, and the two should be linked consistently.

IPE submittals are now being made to the NRC. My impression is that they are not being evaluated rigorously to see if the component failure rates are determined consistently between submittals. I also presume that, for a performance-based maintenance rule to be effective, this component failure rate data must be made a part of the regular evaluation process of the total program.

This presumes, also, that, if the rule is risk-based, then the data must enter into the risk assessment somehow. This will necessitate a "living" risk assessment document for which currently there is no requirement.

To create a living document, the initial document must be carefully baselined to the consistency of the assumptions made. Keep in mind that the whole IPE requirement and review process occurs outside any scrutiny by the public and yet is being proposed for use in making decisions important to safety.

In attempting to equate the maintenance rule with a proposed relaxation of some containment leak rate requirements, we ask the following questions: If the standard objective is a leak-tight barrier, how will it be known if a release path is leaking unless it's made evident through a systems operation? Or is it tested? If the level or frequency of testing is reduced, isn't the probability of identification of failures also reduced?

If the probability of failure is reduced, then the chance of meeting predetermined performance goals is increased and everybody is happy according to the performance-based regulation concept. In other words, the less often one looks, the less often one will find something, so the term of success is longer.

If uncertain failure rate data are used in a risk assessment reference to determine if a regulation can be relaxed, then uncertainties are contained in that assessment. Given these uncertainties, why does it make sense to relax the requirements, especially since failures would have off-site consequences for the public?

The Illinois Department of Nuclear Safety believes it is inappropriate to reduce margins of safety based on risk documents and analyses that contain large uncertainties. It only take one containment isolation valve to

fail to open during an accident to affect the off-site public.

In summary, I think that no performance-based rule is necessary for the conscientious licensee, unless proof is needed of conscientiousness. A rule is needed for the licensee whose standards of conscientiousness are below the desired norm and a change in whose behavior is desired. In this case, more prescriptiveness is needed to effect the desired change for the rule to be enforceable.

Lastly, we favor using the insights derived from PRAs and plant operations and regulatory approaches. I'm in the process of developing a risk-based inspection program for the Illinois inspectors to work in conjunction with that of the NRC. This program will greatly reduce the level of resources that I need and give us more bang for our inspection bucks. So I'm in favor of using PRAs. However, the PRAs must be consistently done, rigorously scrutinized, and continually updated before they can be considered valid enough to be used in making consistent operational and regulatory decisions.

3.5 Tony Pietrangelo
Nuclear Management and Resources Council

Performance-Based versus Risk-Based Regulation: What's the Difference

Last year, I had the pleasure of serving on an ad hoc advisory committee at NUMARC. This committee was formed to develop a strategy on how to moved forward on risk-based regulation in the nuclear industry.

During the course of our deliberations, one of the questions that arose was what the difference is between performance-based and risk-based regulation. I thought I'd use the opportunity today to give you our AHAC perspective on this.

With a performance-based approach, the focus is on results, on achieving goals or performance criteria, and the incentive is to meet those goals. However, what's not talked about much is what happens when you don't meet the goals.

Performance-Based Regulation

- Focus Is on Results
  - Achieving Goals
  - Meeting Performance Criteria
- Licensee Determines "How to"
  - No Prescriptive Details
  - Flexible Implementation
- Does Not Determine What Is Important to Safety

Tony Pietrangelo—slide 1

During internal discussions at NUMARC last year on some proposed rules, it wasn't clear that the industry was ready to deal with the second question. Yet, under a performance-based approach, you have to be ready to meet the consequences when you don't meet the goal or criteria, and that's different from how we do business today. In many cases, a failure to meet goals would be the threshold for inspection and enforcement activity. The licensee has the flexibility to determine how to implement the regulation; however, performance-based regulation does not in any way determine what is important to safety.

Risk-Based Regulation

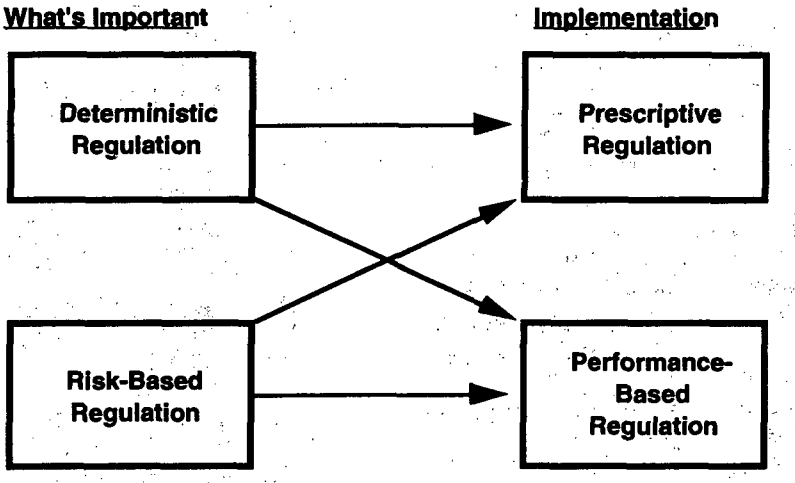
- Definition
  - Use Quantitative Insights from PSA to Focus Attention on Issues Commensurate with Their Impact on Safety
- Focus on What Is Important to Safety
  - Structures, Systems or Components
  - Design and Operational Issues

Tony Pietrangelo—slide 2

Risk-based regulation makes use of quantitative insights from plant-specific PSAs to focus attention on issues, commensurate with their impact on safety. That's what we're trying to get at: Which structures, systems, or components? Which design and operational issues?

Perhaps the best application of the PSA tool is to prioritize what is important to safety. This has been suggested in order to deal with the number of items that have been defined as safety-related. Unfortunately, it seems that on

Figure 3.5.1
Relationships



every issue we come up against, we're prioritizing what's important to safety all over again. On maintenance, on license renewal, on design basis discrepancies, there always seems to be some task up front that requires us to reestablish what's really important.

I think we would all gain some ground if we went beyond the insights from the PSAs performed as part of the IPE process; if we established a ranking tool that everybody could agree to, as well as methods, databases, acceptance criteria, to determine what it is that truly is important.

Figure 3.5.1 is a chart we talked about on the ad hoc advisory committee last year. We didn't use it in our final report. I bounced this off two of my colleagues. One understood what it meant; the other had no idea. So I'll try it on you.

The first column on the left is what's important, and there are two ways to decide what belongs there. Whether you're talking about system or component structure, or about design or operational issues, you can take a deterministic approach or you can take a risk-based approach.

As for implementation, there are two approaches to that, too. You can act prescriptively and say exactly how you will implement a regulation, or you can set the goal or standard and let the licensee determine how best to meet it.

You can determine what's important with either method and you can implement a regulation with either method. That's the message I'm trying to convey. You can have a deterministic regulation implemented through a performance-based approach, or you can take a risk-based regulation and implement it prescriptively. It can be done either way.

What we came to the conclusion in our AHAC that regulation is likely to evolve over the next several years, and there's—no one is under any kind of delusions that we're going to have a step change in how the regulatory process works. We're going to try to build on the operational license experience that we have over the last 30 years, the new technology we have through PSA, and it's going to be an evolutionary process of trying to improve the regulations. Chairman Selin mentioned this morning the importance of a systematic process to do this.

Conditions will and should be imposed on us. We will be expected to maintain or improve safety through a blend of prescriptive and performance-based regulations. From the industry's point of view, especially, it is hoped that fulfilling these conditions will result in an

improved allocation of our resources to what's truly important to safety. It is hoped that we will benefit from our quantitative insights from PSAs, as opposed to treating everything equally, as we do now.

3.6 David J. Modeen
Nuclear Management and Resources Council

Coordination of Industry Activities in Pursuit of Performance and Risk-Based Regulatory Approaches

We in the industry have come a long way, and so has the NRC staff in seeing that there is a blend of regulatory approaches that we can use, based on the insights into risk that have evolved over time.

Current Situation

- Industry Experience Indicates Allocation of Operations and Maintenance Resources Are Not Being Optimized
- Individual Plant Examinations (IPE) Provide the Ability to Assess Population of Plants Relative to the Subordinate Quantitative Objectives of the Safety Goal Policy
- Recognition of Increased Usage and Broader Understanding and Acceptance of Performance-and-Risk-Based Methods by Industry and NRC
- Recognition of Need to Improve NRC Regulations, Processes and Practices, as Well as the Way Utilities Respond to Them

Dave Modeen—slide 1

The situation is not optimal today. Yet we have learned a lot about our plants through the IPEs, NUREG-1150, and through the work the NRC staff has done. Now that most of the IPE submittals are in, we can ask ourselves how we match up against the subordinate objectives of the safety goal policy. In particular, I'm talking about CDF values now for internal events and large, early releases.

In looking at the results so far, my sense is that we stand up pretty well, given the uncertainties. NUREG-1150 indicated much the same, and these examples included the uncertainties in a very detailed analysis.

Despite increased understanding for five plants, we obviously don't have all the answers. Areas still exist that we can work on in the next year or two. Also, there is a need to improve processes and practices, on which Steve Floyd and Frank Gillespie remarked earlier today. It's my belief that we need to concentrate less on the rules and regulations themselves and more on the processes used to achieve safety.

Action Required

- Appropriately Balance Utility Resources Required and Safety Benefit Achieved
- Develop Quantitative Indices and Tools Which Can Assist in Defining Acceptable Plant Performance
- Establish a NUMARC Working Group to Address Regulatory/Policy Issues and Coordinate Development of Technical Guidance

Dave Modeen—slide 2

To establish where to apply your resources and what benefit you will achieve calls for a blend of deterministic prescription and risk-based regulation. We do want to apply, as best we can, quantitative indices. I think they will provide the type of measure that the public wants as well as respond to questions that the NRC is concerned about: How safe is safe enough? When do I know I'm doing a good-enough job? How far do I have to pursue residual risk?

We all know the generic safety issue process that the NRC staff uses and the difficulty in coming to grips with hundreds and hundreds of items, which sometimes languish for years because it isn't really clear how important any one of them may be. That's why we're looking at these risk- and performance-based applications, not to mention the current practices that are underway.

At NUMARC, we're trying to coordinate industry activities so we can best interface with the NRC. As Chairman Selin mentioned this morning, the Commission is looking to us in the industry to take the initiative, and to use the petition process more than we have.

We are in the process of establishing a working group—a policy-level group to help drive our interactions in the industry and with the NRC staff. We hope this will also help us coordinate the actual technical development needed to support whatever initiatives we pursue.

Regulatory Threshold Working Group

- Objectives
  - Establish a New Regulatory Threshold by Which the Industry Can Achieve a More Cost-Effective, Yet Equally or More Safe Mode of Plant Operation and Maintenance
  - Either Confirm, and Thus Sustain, Existing Regulations and the Associated Implementing Guidance, or Promulgate New or Modified Ones
- Big Picture
  - Define How and on What Issues to Obtain Regulatory Credit for Performance-and Risk-Based Approaches
  - Support Change in Requirements Marginal to Safety and Having Inappropriate Resource Burden
  - Coordinate Various Industry Activities; Match Up with NRC Initiatives (PRA Working Group, Regulatory Review Group, etc.)
- Specific Tasks (near term)
  - Establish a Common Industry/NRC Understanding of the Level of Review, Maintenance and Quality of "Acceptable" PSA Models and Techniques
  - Consider the Role of Risk-and Performance-Based Techniques in the Regulatory Process and Develop Industry Recommendations for Their Use as a Basis for Regulatory Decisions
  - Consider the Role of the Commission's Policy Statement on Safety Goals for Nuclear Power Plant Operation in the Regulatory Process and Provide Industry Input on the Revisions to NRC's Regulatory Analysis Guideline
  - Interface with NRC So as to Resolve Both Industry and Regulatory Concerns Regarding the Development and Implementation of New Regulatory Approaches
- Specific Tasks (longer term)
  - Provide a Focal Point for the Coordination of Selected Industry Activities That Serve as Pilots for Generic Applications of New Approaches to the Regulatory Process and Obtain NRC Acceptance
  - Provide Recommendations on Additional Regulations or Regulatory Practices Where Improvements Are Feasible, Justifiable and/or Warranted
  - Reflect What Is Learned from the Above Activities in Industry Guidance Document(s) That Define and Illustrate the New Regulatory Threshold

Dave Modeen—slide 3

"Regulatory threshold" is a nebulous term. In an attachment to our December 21st letter to Chairman Selin, we noted that we didn't want a regulatory threshold to focus only on PRA or PSA. We do believe we can get to a threshold that defines how safe is safe enough. As a point of reference, I note that the safety goal policy was issued in 1986. However important the policy may be, there is no clear indication of how the industry is expected to respond to that policy, or what the policy really means in the course of day-to-day business in the industry.

In a lot of areas, we're going to confirm the status quo. In other areas, we're going to find we need a different approach.

The working group we establish is going to help us look at cases where the NRC staff accepts a licensee's plant-specific application to use a performance-based or a risk-based approach. In the past four or five years, there have been more instances of this issuance of regulatory credit, but at other times it's really been lacking.

The next big task will be to support any change in this particular program on the requirements marginal to safety. The group may also consider some of the broader activities under the regulatory review of Frank Gillespie, including how the two pieces fit together, and the subsequent industry interactions on those two pieces.

The working group has not yet met. The mission statement we drafted will be the subject of discussion during the first meeting of that group. The specific tasks that I lay out here will form at least the genesis for what that group will be tackling. It's my sense that this group's work will be accomplished in two years or less, or else we're probably not going to achieve success.

I think the first objective will be to establish what is an acceptable model when a risk-based approach is used. What is an acceptable level of detail? What is a living PRA or PSA? How are uncertainties addressed?

We have to understand what the answer should be, depending on the particular application. This understanding has to be held in common by the NRC staff and the licensees. Then I think licensees will be able to provide a submittal or apply for a license change with confidence. It is hoped we could then expedite those implementations.

We really need to prioritize those items whose resolution promises some reduction in burden at the same level of safety. Where the promise isn't a strong one, the item should go to the end of the list, or off the list altogether.

The third bullet in this slide addresses the implementation of the Commission's safety goal policy, which is not quite two years old. The staff has had an interim procedure on its application as it relates to generic safety issues.

Unfortunately, I think the implementation of the policy has received some criticism from the ACRS that it doesn't go far enough, that it's not high-level enough strategically, and that it doesn't address existing or future regulations. In our December 21st letter, we said we would like to enter a dialogue with NRC on what safety goal policy should mean.

We hope to work with the NRC staff to coordinate industry views on safety goal policy in order to avoid a piecemeal approach and so that the staff isn't confronted with submittals from 50 different licensees. If the solutions are plant-specific, their general outlines ought to be fairly generic. That's what we're going to try to help identify.

In the longer term, we hope to help facilitate development of the technical guidance and their reviews by the staff. We will try to have one or two pilots on a given topic, see how they test out, resolve the concerns, and then other plants can follow.

I believe that there will be some near-term applications that we can get under review before this year ends, and I think it will be a matter of prioritizing the additional applications as the next couple of years play out. Frank Gillespie has an interesting list of some things we can look at in the near term.

The second bullet in this slide alludes to the longer term perspective of NUMARC's own internal process. Many of the items we identify may not be addressed by the regulatory threshold working group we are creating. We will have to form an additional working group or an additional ad hoc advisory committee to look at these items and then, of course, deal with them on a case-by-case basis, again evaluating them using criteria such as their promise to reduce the regulatory burden, and their feasibility.

Finally, we're going to keep in mind just what type of industry guidance is really warranted, and that's going to be in our thought process all along. We are not looking for a change in the location of the guidance. As was indicated earlier, we wouldn't achieve anything by doing that. We are not looking for additional guidance or regulations, either, as often has occurred in response to risk insights in the past.

What we do seek is to know where we can make effective changes and hope to optimize them, so that resources are appropriate and they are spent on the right items.

3.7 John Hosmer
Florida Power & Light

Probabilistic Safety Assessment Examples for the "What" and "How" Regulating Decision

Last year, I served on the NUMARC ad hoc advisory committee with Tony Pietrangelo. That AHAC came to three conclusions. First, there are two questions that have to be answered in the regulatory arena: What is important and, once you have decided that, how do you implement programs related to what is important?

What Is Important?

Q List

Deterministic Regulation	Uses Definitions: Those Systems and Structures Needed to Prevent or Mitigate Accidents
PSA Regulation	Allows the Systems and Structures to be Defined Based on an Agreed upon PSA Threshold (Results: a Focused List of Safety and Non-Safety Systems)

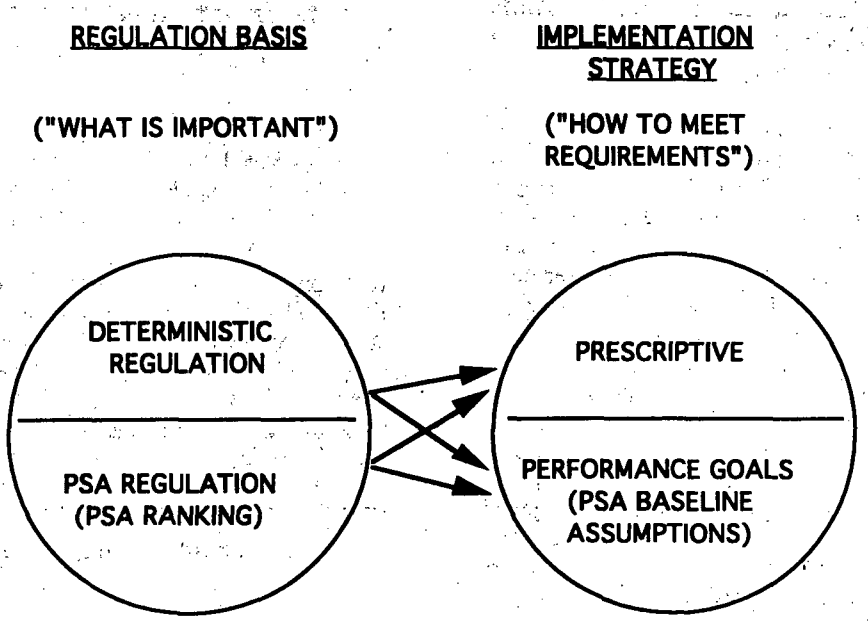
John Hosmer—slide 1

Second, the NUMARC AHAC concluded that you need to change the blend of tools used and how you make these fit what is important and how to make decisions. For example, in the "what is important" area, you need to consider both deterministic regulations and risk-based regulations.

In the "how to make decisions" area, you need to look at two different ways to deal with implementation strategy. One is the classic prescriptive approach; the second is performance-based. For example, PRA baseline unavailability assumptions may be your performance goals.

Third, the AHAC concluded that PRA is one of the better tools out there for insights into how to make this blend.

Figure 3.7.1
Future Mix



-FOUR POSSIBLE COMBINATIONS

Today we define as "safety-related" anything that is part of the reactor coolant pressure boundary or needed to prevent or mitigate an accident. You get a very long Q-List of components, systems, and structures as a result.

If you use your PRA and take some threshold criteria—for example, define all those things that contribute to 95 percent of core damage frequency—you will get a different insight into the list of things that are important. You will find a much smaller list, such as 2 percent of the ten- or twenty-thousand items Marty talked about. More important, you will find some items are safety-related, and some are not.

For example, we submitted our PRA at Turkey Point, and found that instrument error, which is non safety-related, is more important than high-pressure and low-pressure safety injection. This was a very interesting insight, and something to act on.

How to Meet Requirement?

Maintenance Rule Implementation:

Typical Today	(A) Insure All SR Systems Have Unavailability Not Greater Than Some Constant Percent
PSA Performance Concept	(B1) PSA System Baseline Unavailability (B2) Monitor Initiator Frequency and Insure Equal to or Less Than PSA Baseline (EG Reactor Trips, Loss Secondary Heat Removal)

John Hosmer—slide 2

The maintenance rule is, I think, the first real attempt to try to deal with the bottom two sets of the Venn diagram shown in Figure 3.7.1. It suggests that you use PRA to define what is important, and it suggests that you might use PRA to set your performance goals. If we had done the maintenance rule two or three years ago, I contend we would have put out a rule requiring us to take into account all of our safety-related structures, systems, and components, look at our EOPs, and find out anything else that the operator takes credit for; that is what is important. We also would have tried to set some constant, high-level unavailability assumption for all those things in order to monitor them.

We are a lot smarter today. I think PRA taught us to be smarter, and what we are proposing to do is shown here in a maintenance rule that suggests that, from the big population called "all safety-related structures, systems, and components," we isolate those systems referred to in our EOPs, and apply the inside of our PRA, and then shrink that scope down to what truly is directly related to safety.

Secondly, in setting performance standards for their systems and components, many people doing the V&V program on the maintenance rule have chosen to use the unavailability baseline assumptions in PRA as the performance threshold. In addition, they are monitoring frequency of initiators, such as reactor trip. They are using their baseline PRA assumptions and monitoring frequency as their monitoring point.

In summary, the AHAC concluded that there are two questions to be answered: What is important to safety, and how do you implement that? The AHAC concluded that we need to change the blend of the way we do business, and it concluded that insights from PRA are a powerful tool for doing this.

3.8 Michael W. Golay
Massachusetts Institute of Technology

Performance-Based Regulation of Nuclear Power Plants

At MIT, we got involved in working on performance-based regulation about ten years ago when we started a project on advanced reactors—the so-called "second generation"—for which we had hopes of making considerable improvements in both safety and economics.

One of our early concerns was that, under the existing system of nuclear safety regulation, it would be very hard to ever get licensed a reactor using a coolant other than light water. In searching for a way to approach this problem, we worked on an NRC-sponsored project to try to identify a system that would allow for a different coolant. That is one reason why we are here today.

When we looked into this matter, we viewed it not as a zero-sum game where some might lose and some might win, but rather, if done right, an experiment where one might achieve both improvements in safety and much greater economy. I believe that this can be achieved, but history has certainly shown that the possibilities for things going awry and being disappointing in the nuclear regulatory process are abundant.

Limitations of Current NRC Regulatory Approach

- Is Highly Prescriptive, Often Presuming the Nature of Plant Features
- Produces Non-Uniform Safety Results
- Produces Uncertain Levels of Safety
- Inhibits Assumption of Full Responsibility for Safety by License Holder
- Fail to Encourage Safety Improvements
- Inhibits Technological Innovation
- Favors Replication of Existing Technologies and Analytical Approaches
- Bombards NRC Commissioners with Burden of Detailed Decision-Making, thereby Inhibiting Timely Formulation of Policy

Michael Golay—slide 1

The first slide shows the reasons why we think we need another regulatory approach. The problem we have with the existing system of safety regulation is that it does not guarantee either a high or uniform level of safety.

This was illustrated most clearly when the new production reactor was under design by the Department of Energy, and you will recall that the Secretary of Energy said that that reactor

would meet or exceed a level of safety consistent with that of the civilian fleet of reactors. Well, that was a great idea, until the people reporting to him actually had to do it. What they found was that there wasn't a unique statement of that level of safety that everybody could agree with. This is reflected in the PRAs that exist today, which is not to say that the plants we have are unsafe, but rather it is rather hard to say just how safe they are in aggregate.

The people who were facing that problem with the new production reactor were spared solving it because the project was shut down. This is probably just as well because having to design a new regulatory process as part of designing a new reactor is rather daunting. It will, in fact, take the NRC considerable time to come up with a process that is both workable and satisfactory to many.

The second reason why we at MIT got involved in this workshop is that the current regulatory system inhibits technological innovation. One of the clearest cases concerns the use of modern informatic technologies, which are having a very difficult time penetrating the nuclear industry because of difficulties satisfying the regulatory authorities that they will not introduce new ways for things to go wrong. This is also true with advanced reactors.

Basis of Non-Prescriptive Regulation: NRC Safety Goals, Including Future Amendments

- The Safety Goals Are Stated in Terms of Expected Risks.
  - Thus, Some Use of Probabilistic Risk Assessment (PRA) in Non-Prescriptive Regulation Is Implied.
- Safety Goals Can Guide Formulation of Risk Acceptance Criteria:
  - As Literally Applied Standards of Acceptable Risk (Not Recommended),
  - As Bases for Performance Standards Against Which Actual Performance Can Be Compared (e.g., Diesel Start Reliability) (Recommended),
  - As Bases for Deterministic Decision Rules (e.g., Test-Based Component Reliability Requirements) (Recommended).

Michael Golay—slide 2

It already has been mentioned that going to performance-based regulation means using PRAs in some fashion. I describe this process as an experiment because the best fashion is not obvious. Rather, we are going to have to try a variety of approaches before we really know what works best.

Using PRA results directly as decision making criteria is really not feasible, primarily because of the uncertainty associated with the results. I think this uncertainty will persist for decades, so we need to know how to live with it. PRA results can be used as the basis for determining performance standards, as was done with the diesel start reliability requirements, for example. A performance standard is set, consistent with the level of safety indicated in the PRA and with the level desired as expressed in the safety goals.

PRA results can also be used as the basis for making design decisions in terms of what kinds of components are acceptable. Right now, for example, we do not have reliability requirements placed on the components installed in our plants, although we are edging up to reliability requirements for systems in the plants. This is striking when you compare it with how nuclear power plants are designed, say, in Germany, where the reliance on testing by manufacturers in order to demonstrate high reliability is much more important. A performance-based regulatory system can build in natural incentives to get good results of the kind just illustrated.

Aspects of Using Probabilistic Risk Assessments (PRA) in Performance-Based Regulation

- Models
- Data
- Uncertainties:
  - Modeling Approximations
  - Data Variability
  - System Behavior Sensitivity
  - Phenomenological Ignorance
- Use of Deterministic Compensation for Uncertainties
- Use of Conservative Compensation for Uncertainties
- Use of PRA to Base Deterministic Performance Goals and Decision Rules

Michael Golay—slide 3

Being able to ensure a high level of safety is not the problem with PRAs. The big problem is being able to show that the associated uncertainty is reasonably small. People who discuss PRA results often don't focus on this latter point, which is at the heart of formulating a regulatory system that will actually work. Some of the more important sources of uncertainty are shown in Slide 3. These must be taken into account. Now, this looks like a fairly daunting list, but there is nothing here that is not taken into account under the existing regulatory system.

The things to take into account are the models' data and uncertainties that you can read here, and you have to have ways of dealing with the uncertainties. I have listed in the last three bullets some of the things you can do, which include using some sort of deterministic compensation for uncertainty. This need not be conservative, but may simply be a recipe for resolving ambiguity in what you understand about a system or data, and using a PRA as the basis for deterministic performance goals and decision rules.

Necessary Features for Practical Probabilistic Risk Assessment (PRA) Use

- Standardized, NRC-Approved:
  - PRA Models
  - Data Bases
  - Means of Refining Data Bases and Models
- Standardized, NRC-Approved Methods for Assessing Acceptable Compliance in Terms of:
  - Design
  - Operations
  - Evolving Industry Experience
- When Using PRA Both Must Be Addressed:
  - Expected Risks
  - Associated Uncertainties

Michael Golay—slide 4

One of the problems is that standard models and databases are not available to people who would like to buy into a performance-based regulatory approach. What I suggest is that we use an approach similar to the one we use to deal with the emergency core cooling design problem. The NRC formulates the models and databases they will accept, and an applicant is always free to come in with alternative suggestions. Yet we need to decrease the number of alternatives a person confronting this approach to regulation actually faces when trying to do a practical analysis.

One of the hardest parts is not actually identifying acceptable performance criteria, but identifying ways of assessing whether people have actually complied with the criteria. When we are talking about testing, it is fairly clear how to go about this, but, for example, one of the problems likely to arise concerns that of evolving industry experience.

Right now, data are generated everyday that are not being collected. When you look at information you would use in a regulatory system like this, one of the key elements is the database. The data are very expensive to obtain, and until you have a system in place to use the data, you don't have an incentive to go out and spend money to collect them. One of the things to expect is that a database will change over the life of a regulatory system, and you have to have a way of taking into account the fact that your standards may change either up or down, depending on what experience actually reveals. Particularly for phenomena related to plant aging, this may be quite important. This is one of the problems that has to be worked out.

Important Sources of Uncertainty

- Incomplete Problem Statement
- Modeling Approximations
- System Behavior Sensitivity
- Phenomenological Ignorance, Including:
  - Human Behavior
  - Severe Accident Phenomena
  - Earthquake Severity
- Common-Cause Failure Modes

Michael Golay—slide 5

To return to the uncertainties, they are large, and they are embedded in PRAs today. Yet I foresee a progression to where PRAs can be directly applicable to nuclear regulatory safety. In trying to achieve that, it would be very useful to get everybody to agree on what it is we are trying to analyze. That can actually be quite an achievement when you are dealing with a complex problem.

When we are dealing with Level 1 PRAs and are concerned with estimating the expected frequency of core damage, the uncertainties are manageably small. That is the area where the most direct applicability exists, and I would suggest to the NRC that that is where the resources be focused in the early experiment to evolve a performance-based regulatory system.

With the Level 2 PRAs, we are concerned with how radioactive material from a severe accident might escape from the containment and there are many more uncertain phenomena. Some blend of deterministic treatment of issues identified within the PRA structure will inevitably be required.

Finally, with the Level 3 PRAs, we are concerned with the propagation of pollutants off-site, which may harm the general public. The need for a deterministic treatment becomes yet greater. I think we simply must accept the fact that some blending of regulatory approaches is going to be required, consistent with some of the previous remarks.

The list of uncertainty factors is fairly long here, but is not different from what is currently being taken into account. Our existing regulatory system is essentially a social pact through which we agree to treat these uncertainties in a certain way. If you go to a performance-based regulatory system, the amount of uncertainty you are confronting does not increase. It simply has to be taken into account in a different fashion.

Aspects of Future Work to Develop a Performance-Based Regulatory Framework

- The Best Performance-Based Regulatory Approach Is Not Obvious
- An Investigation of Alternative Approaches Applied Realistically Is Needed to Identify Beneficial Refinements
- Use of PRA Is Often Resisted Because Some Results Are Significantly Uncertain
- The Uncertain Revealed through PRA Is Not Different from That Inherent in the Current Regulatory Approach
- Non-Prescriptive Regulations and Implementation Can Be Refined as Knowledge Improves
- The Current Regulatory Approaches Is Difficult to Refine

Michael Golay—slide 6

What I suggest in terms of process is for the NRC to treat this as an experiment where, as is noted in Slide 6, the best way of going about this is not obvious. If it were, we would probably be doing it right now. As we start to use a performance-based or nonprescriptive regulatory approach, our models and database will improve. We will have a reason for their continual refinement, which today is much less the case.

Important Questions Concerning the Practical Implementation of Performance-Based Regulation

- How will performance-based regulation blend use of deterministic and probabilistic regulatory criteria in different areas of decision making and enforcement?
- How will the NRC's traditional approach to the regulation of design, construction and operational aspects of a plant be changed?
- What is the rationale for "defense-in-depth" and how is it to be implemented and maintained?
- What other deterministic consideration (such as redundancy and diversity) shall be maintained?
- Where is performance-based regulation consistent, or not consistent, with current NRC policies on standardization, backfitting, severe accidents, safety goals?
- What industry acceptance/preference exists for performance-based regulation?
- How will NRC oversight of inspection and enforcement change under performance-based regulation?
- What documentation will a license applicant submit for review?
- How does the proposed framework improve safety and why?

Michael Golay—slide 7

Slide 7 is a long list of practical questions, which illustrates in part why it is not obvious how to identify the best system. I think there are basically good answers to most of these questions.

The NRC should establish the models and analytic approaches to be used, and establish an NRC-approved database. I believe that this is key to making practical progress in formulating this regulatory approach.

Working through a number of examples, the NRC should try to evolve a general approach to formulating deterministic performance goals, and success criteria based upon PRAs.

That is, the NRC should not try to use PRAs directly. What I foresee is a combination of the so-called prescriptive approach based on PRAs, which is hinted at in the NRC's examination of NUREG-1150 in severe accidents. If we look at some examples of the kinds of plants we have today, what are the general lessons we can draw from a PRA and apply them to the treatment of severe accidents?

Recommended NRC Framework Development Actions

(Focused upon the Regulatory Examples to Which Performance-based Regulations Would be Applied)

- Establish a Set of Approved PRA Models and Analytical Approaches
- Establish an NRC-Approved Data Base for Use in PRA
- Establish a General Approach for Formulating Deterministic Performance Goals and Success Criteria, Based upon PRA Results
- Establish a Standard Approach for Determining Performance Success Criteria, Demonstrate Compliance and Their Refinement as Experience Accumulates
- Establish an External Review Panel to Critique, Advise and Assist the NRC in This Work on a Continuing Basis

Michael Golay—slide 8

I foresee this above-described, general use of PRAs most likely being combined with plant-specific PRAs where, over time, the nuances of dealing with a large number of different PRAs will be worked out, and where the more general PRAs can be used less as time goes on. But I suggest that, actually, a parallel approach is what would make sense as we work this out.

The NRC, I think, also has to establish methods of performance success and, as someone said, of how to determine what happens if you don't meet the criteria. In some cases, I think what you have to do is go back and shape up, but it may be more subtle than that.

Finally, the NRC could use the help of an external board similar to the ACRS—perhaps the ACRS itself—with a fair amount of intensive contact. This process involves very subtle and complex questions. The NRC could benefit from a continuing critique. Right now, that isn't built into the process so far as I am aware. I have seen cases where a board can be quite valuable in this kind of enterprise.

Reasons to Continue Developing the Performance-Based Regulatory Framework

- Greater, More Uniform Safety
- Safety Responsibility and Authority Resting with Licensee
- Swifter, Clearer, More Consistent Regulatory Decisions
- Increased Ability of NRC Commissioners to Provide Policy Guidance
- Greater Technological Innovation

Michael Golay—slide 9

The essential idea shown in Slide 9 to make uniform the allocation of resources and the achievement of a high level of risk reduction across plants. This is the basic reason for wanting to go to this method of safety regulation.

For those who are concerned with making the nuclear power plant fleets yet safer, I think this is the best way of going about it. I suggest that it could be very useful to have a concrete goal for undertaking performance-based regulation and my suggestion is to use the plant aging and license extension issue to drive that goal.

What we are seeing right now is that the uncertainty associated with the license extension issue is effectively driving utilities away from preparing to extend their licenses. We have seen Yankee Rowe and Monticello decide not to pursue extended licenses, at least for the moment. When you talk to people at other utilities, you learn they are investing less than they would like to in order to get very reliable, long-life performance. The uncertainty in the regulatory process is having a corroding effect on the decision making at many plants. Effectively, I would say it is driving people away from investing in the plants.

One alternative to the 40-year license life would be a performance-based method of regulating a plant. A license would last indefinitely, so long as the plant were able to meet the performance criteria. If this option

were to become available in about ten years, it could be a very useful and concrete way of resolving the regulatory uncertainty that plagues the existing fleet of nuclear power plants, and which has the potential to reduce their safety as time goes on.

3.9 Open Forum Discussion Summary

Herschel Specter
New York Power Authority:
More involvement from personnel outside the traditional nuclear industry should be encouraged. For example, the participation by Neill Howey from the Illinois Department of Nuclear Safety is especially welcome.

Judith Johnsrud
Environmental Coalition of Nuclear Power:
Basing regulations on performance based on risk assessments is reminiscent of an attempt to inject contentions of severe accident probabilities and consequences into the licensing process for Three Mile Island Unit 2, which were rejected by the Atomic Safety and Licensing Board because they were highly improbable events and therefore outside the scope of the proceeding. Basing performance on probabilities, and basing probabilities on performance of highly complex systems is a disturbing approach.

Paul Gunter
Nuclear Information Resource Service:
There is already a de facto elimination of safety requirements process in place. The Thermo-Lag issue at Comanche Peak is an example. From a public perception viewpoint, there would be dissatisfaction with changing to performance-based regulation. It appears to represent a proliferation of standards and standardization, coupled with the streamlining or deregulation of standards.

Michael Golay
MIT:
Mr. Gunter's portrayal was incorrect. Because there is currently not a consistent regulatory basis, there are inconsistencies in regulation. Performance-based regulations would get rid of these inconsistencies. A move to performance-based regulations would uncover marginal requirements.

Paul Gunter
Nuclear Information Resource Service:
Demonstrations have shown that 3 hour passive fire barrier systems, which are installed in 79 reactors, are not passing qualification/acceptance tests. It is disturbing that we are moving away from this test based standard and may apply this approach to other products or techniques within the industry.

Jack Heltemes
NRC:
What we are trying to do here is to assess whether or not we have NRC regulations which are not defendable, and if they are not, then we have told the industry and the public that we are willing to consider changing those regulations, but in doing that, we do not intend to decrease the margin of safety.

Michael Golay
MIT:
Performance-based requirements would depend on the functional importance of a component, such as a fire barrier, and might include deterministic performance standards for components. A component that did not meet the performance standard would be rejected

Charlie Bergeron
Grove Engineering:
The present prescriptive regulations are based on perceptions of risk, but were formulated before tools for directly relating the risk to the regulation were available. PRAs should be used to learn further about nuclear plants. It makes sense to use PRA data to move toward a performance-based regulatory approach.

John Hosmer
FP&L:
We should not throw out the concepts that have been developed in the past (i.e., defense-in-depth). PRA should be used as a tool and not to replace what we have previously learned. PRA should be applied in a manner that creates a win-win situation for both the NRC and nuclear utilities.

Paul Smith
Readiness Operation:
An important subset of the performance-based regulatory approach issue is the increased knowledge we have about reactors and regulations. We can use this knowledge within the existing technology to improve the regulations and reduce risk, without relying on risk assessments. Such an approach might result in earlier benefits.

Neill Howey
Illinois Department of Nuclear Safety:
PRAs are a measure of risk with associated uncertainties. Although there is a small risk for each nuclear plant, the combined risk of all the nuclear plants may not be so low. The nuclear industry must get the public more involved in the questions of (1) what level of overall risk is the public willing to accept for nuclear power, and (2) how can that risk be reflected in the NRC performance standards. Activities in these areas are perceived by many people to be "smoke and mirrors."

Roger Reedy
Reedy Associates:
We tend not to talk to each other in the same language. Sometimes an item that is completely important to safety is supported by other items, which are in turn supported by other items,, and so on for many levels of supporting items. We tend to treat all of these levels as equally important. PRA can be applied to distinguish between the important-to-safety and the trivial-to-safety.

Michael Golay
MIT:
The nuclear industry persists with the model that the poor public perception of the industry is a lack of information although this is not true. Trust is a key component of why the public is frightened of nuclear power. There are two separate questions: how does the NRC establish requirements that ensure an acceptable level of risk, and how can we develop the public trust that is necessary to achieve public acceptance of what the NRC has done.

Dave Modeen
NUMARC:
The public does not have the patience to become technically literate enough to understand the technical issues. The NRC should continue its efforts, along with other Federal agencies, to decide on the role of risk assessment in Federal regulation. The staff should also examine what has been learned from NRC public meetings about communication with the public on these matters.

Judith Johnsrud
Environmental Coalition of Nuclear Power:
Using conservatism that may far exceed performance-based regulations is in public's interest. Some misallocation of resources does exist that could be corrected, although there may be varying opinions concerning where they are.

4. Containment Leakage, Testing Requirements, Leakage Rate and 10CFR50 Appendix J

4.1 Lee Russell
Baltimore Gas & Electric

Containment Leakage and Leak Rate Testing

Last year, I got interested in looking at ways that licensing could help the cost-effectiveness of Calvert Cliffs, and one of the obvious things that struck me was that Type A testing, or integrated leak rate testing of containments, occupies about 3 days of critical path time during refueling outages.

Containment Leakage and Leak Rate Testing

1. Why Examine Appendix J - Type A Testing?
2. BG&E Leak Rate Testing Experience.
3. Potential Benefits of Reducing Test Frequency.
4. Additional BG&E Observations.
5. Proposal for Performance-Based Rule.

Lee Russell—slide 1

This afternoon, I will briefly examine why we do containment A testing, share with you our leak rate experience, suggest some benefits from reducing the frequency of Type A testing, provide some observations that are relevant to supporting a reduced test interval and, lastly, put up a strawman of proposed change to intervals between Type A testing.

Type A risks and burdens are several. As supported in WASH-1400 and studies since then, it is recognized that the additional risk to the public from containment leakage is very small, even when several times greater than what is allowed under technical specifications.

Type A Risks and Burden

- Risks are Insensitive to Leak Rates Many Times Current Allowables
- Risks are Dominated by Containment Failure or Bypass Accidents
- Post-TMI Severe Accident Research Shows 'Ultimate Containment Strength' is More Important Than 'Ultimate' Leak Tightness
- Probability of Containment Failure is Not Affected by Frequency of Type A Testing
- Type A Testing Impacts Critical Path During Refueling Outage

Lee Russell—slide 2

NUREG/CR-4330, for example, shows that, even where containment leakage occurs 100 percent per day, the increase in estimated population dose expressed as a person-rem per reactor year is about 15 percent. Where the leakage is lower than 1 percent per day, the NUREG indicates that no appreciable increase occurs in risk to the public.

What dominates the risk are major containment failures, such as breaches of the containment or failure of containment isolation valves to fully shut, so that a leakage path is created to the environment, or an interfacing system LOCA.

In examining severe accident scenarios that result in containment melt-through, the ultimate strength of the containment plays a much more important role in protecting the public than does an increase in leakage's several times the allowable limit.

Studies by Grove Engineering have concluded that Type A tests have no deleterious effects on containment in terms of stress. If Type A tests did have such effects, we would do well to consider them when we reviewed the appropriateness of the interval set between Type A tests.

At Calvert Cliffs, Type A tests take 3 days of critical path time to set up the test, and for pressurization, stabilization, measurement, and depressurization. In addition, as a safety precaution, we prohibit work in spaces adjacent to the containment during performance of the ILRT.

BG&E Test History

- Only One Type A Test Failure (Due to Valve Problems, Not Structure)
- Failure was First Periodic ILRT for Unit 2
- Type A Test Results Do Not Show an Increasing Trend in Leak Rates
- Type B and C Test Results Good
- Having Obtained Exemption for Type B/C Testing for 24-Month Cycle

Lee Russell—slide 3

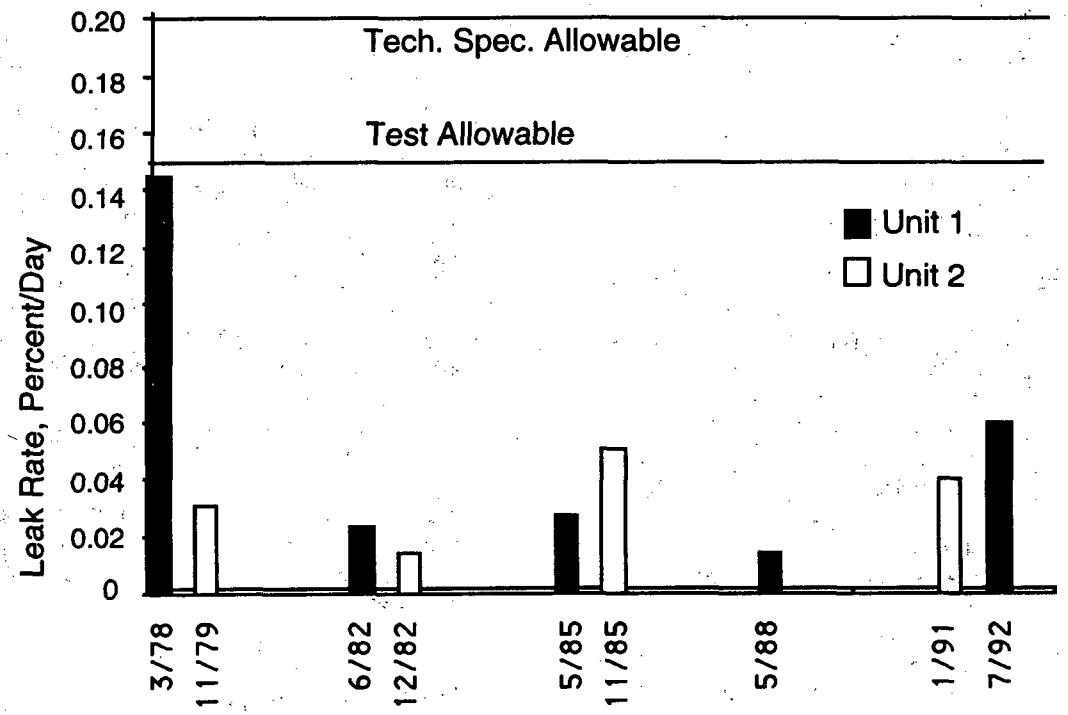
We have had one Type A test failure in our test history. In 1979, our initial Unit 2 periodic leak test failed. We had a containment sump isolation valve that didn't fully shut because a limit switch was improperly set. In spite of that, our measured leakage was less than 5 percent per day.

Figure 4.1.1 shows our history of Type A tests, and I want to point out that the November 1979 test results are for the subsequently successful test, not the failed test. The point I want to convey is that, once you have a couple of tests under your belt, and some learning experience, you can consistently stay well below your allowable limits for Type A tests. We show that we have been able to stay about one-third below the allowable test limit for Type A tests.

After performing numerous Type B and C tests of penetrations and valves, I think you normally can predict what valves and penetrations are going to be your problems. Thus, at appropriate testing intervals, you can ensure through maintenance that you don't exceed your test limits for Type B and C tests.

In 1991, the NRC issued Generic Letter 91-04, which permitted the test interval for Type B and C tests to be extended to a nominal 24 months. Because Calvert Cliffs is on a 24-month fuel cycle, we took advantage of the extension to avoid having to ask the NRC for

Figure 4.1.1
Calvert Cliffs Type A Historical Test Results



exemptions because we were 24 months and a few days or weeks beyond the allowed limit of the tech spec at that time.

To offset this longer test interval for Type B and C tests, however, we have reduced our allowable B and C total leakage to 0.5 L_A.

Cost of Testing

- Type A Tests Typically Cost BG&E $1.8M Each
- Performance-Based Testing Could Reduce Test Frequency to Once Every 10 Years
- Resulting Savings to BG&E Could Be $14.4M for Remainder of Current License Term

Lee Russell—slide 4

Now let's look at the cost of testing. At Calvert Cliffs, we typically take 3 days of critical path time to perform our ILRTs. At the time of the year that we perform these tests, our replacement energy costs are roughly $500,000 a day. This results in about $1.5 million in replacement energy cost for the duration of the Type A test. In addition, we have about $300,000 of other costs associated with manpower, equipment rental, consultants, and so forth. In total, a Type A test costs about $1.8 million per test.

If we assume that we would be able to reduce our test frequency to once every 10 years under a performance-based regulation, then we could avoid eight tests remaining in the 40-year life of the plant. This would result in a savings of $14.4 million.

If we assume that we are going to extend the license for an additional 20 years on each unit, then such a change in test frequency would result in an additional $14.4 million in savings.

In examining the Appendix J rule published in 1973, I could find no basis for the test interval that was specified. This makes sense, I think, because at the time there was very little history of integrated leak rate tests to go on, and, therefore, NRC made use of the conservative test interval for Type A tests. But things have changed significantly since then. We now have a significant test history of Type A tests, and we have a much greater insight into the risks to the public related to containment leakage.

BG&E Observations

- Basis for Current Type A Frequency
  - No basis found for 3 tests in 10 years
  - Existing rule has 'performance-based' element:
    - one test failure requires NRC approval of future test schedule
    - two successive failures require testing at each refueling until two successes
  - Testing frequencies are typically based on failure rates. In the absence of failure rate history, the test timing is subjective.
- PLEX Studies
  - Type A tests rarely discover leaks that could not be detected by Type B or C tests
  - Type A tests do discover leaks caused by modifications that impact liner integrity
- Severe Accident Source Terms
  - NUREG/CR-4330 Vol. 2 - reviewed the PRA data to conclude that risk effects are marginal
  - ALWR work using mechanistic source term methods confirms marginal risks related to containment leakage

Lee Russell—slide 5

Interestingly, when a facility fails a Type A test the existing rule is based on performance, and additional testing requirements are provided accordingly. Normally, test frequency is based on the availability or reliability you are trying to demonstrate and on the failure history of a component. For Type A failure rates, which are insignificant, such a basis of frequency results in a very subjective determination of what an appropriate Type A test interval should be.

As part of a plant life extension study performed for EPRI, DOE, and others, it was concluded that Type A tests seldom detected leaks that could not have been discovered by Type B and C tests.

This conclusion is consistent with NUREG-1273, which was based on an examination of all reported failures to meet Type A, B and C tech spec limits. The conclusion was that the Type B and C tests were capable of detecting 99.4 percent of containment documented breaches and, conversely, a Type A test was needed to detect only .6 percent of containment breaches.

NUREG/CR-4330, Volume 2, reflects the use of PRAs for various types of containment breaches using severe accident source terms.

Containment bursts to leakage rates that were five to ten times above allowable tech spec limits were examined. It was concluded that the risk to the public was marginal.

One of the NSSS vendors conducted an analysis of its ALWR design using the physically based source term or the new source term. The results showed that the doses to the public using the new source term were similar to those obtained using TID 14844, where a containment leakage was important.

Performance-Based Type A Testing Suggested Schedule

Case 1 - Initial Test OK

- First periodic test at appropriate refueling (3-4 years)
  - First Periodic Test OK
    - Second Periodic Test in 10 years
  - First Periodic Test NOT OK
    - Second Periodic Test at Next Refueling

Case 2 - Initial Test NOT OK

- NRC Approves Schedule for First Periodic Test
  - First Periodic Test OK
    - Second Periodic Test at Appropriate Refueling (3-4 years)
    - Subsequent Periodic Test in 10 years
  - First Periodic Test NOT OK
    - Second Periodic Test at Next Refueling (1-2 years)

Lee Russell—slide 6

This leads me to propose that it is time to change the Type A test interval to a 10-year period. For a new plant that undergoes a preoperational test, I would suggest a periodic test within 3 to 4 years after startup to get some test experience. Assuming that those two tests were satisfactory, the 10-year test interval would be adopted.

It should go without saying, that if a plant fails one of the 10-year Type A tests, it would be only be appropriate to discuss with the NRC what the subsequent test interval should be, based on the specifics of the failure.

Conclusions

- Allowable Leakage is a Plant-Specific Decision
- Decreasing the Number of Type A Tests Does Not Significantly Change Risks
- Decreasing the Number of Type A Tests Could Save $14.4M for Calvert Cliffs
- Performance-Based Testing Frequency Retains Protection of Public and Allows for Justified Cost Reduction

Lee Russell—slide 7

In conclusion, I think there is sufficient material published that supports larger containment leakages than we currently live within our technical specifications. Whether or not to allow more leakage than currently permissible would be a plant-specific decision. Decreasing the number of Type A tests wouldn't add significant risk to the public because most containment leaks can be found through Type B and C tests, and because increases in leakages do not significantly, in fact, increase the risk to the public.

The bottom line, it seems to me, is that performance-based testing will protect the public and allow for a justified cost reduction. We at Calvert Cliffs would save $14.4 million if the 10-year test interval were in place, and a similar amount if we extended our license life an additional 20 years.

4.2 Kevin Christian
Grand Gulf Nuclear Station

Proposed Performance Based Testing—GGNS 10CFR50 Appendix J, Containment Testing

The subject of my presentation today is the proposed modification of Appendix J testing to make it a performance-based regulation. I will focus on the testing intervals within the Type A, and the Type B and C tests, and describe a proposed program to implement the performance-based regulation and how it would affect Grand Gulf.

Subject

- NRC's proposed modification of Appendix J, Containment Testing, to a performance based regulation (Federal Register Vol 58, No 16)
  - Modification effects testing intervals of:
    - Type A Tests - Integrated Leakage Rate Test (ILRT) of overall containment
    - Type B & C Tests - Local Leak Rate Test (LLRT) of pressure containing or leakage limiting boundaries of the containment and containment isolation valves
- Grand Gulf Nuclear Stations (GGNS) application of the proposed modifications.

Kevin Christian—slide 1

I will discuss the advantages and some of the disadvantages of such a performance-based regulatory program at Grand Gulf. I will review some testing history, explain our rationale for embracing a performance-based regulation, and conclude with some cost analysis.

Contents

- Testing Intervals
- GGNS Proposed Program
  - Advantages
  - Disadvantages
- Application of Program at GGNS
  - Testing History
  - Justification
  - Cost Analysis

Kevin Christian—slide 2

Currently, a Type A test is required three times every ten years; a Type B and C test is required once every two years. With the proposed modification, a Type A test would be required once every ten years, and a Type B and C test would be based on the performance history of a piece of equipment.

At Grand Gulf, implementation of a performance-based program would mean conducting a Type A test once every ten years. Every two years Type B and C test would be conducted on a component every two years that had passed only one test or had failed the previous one. A test frequency of every five years would be established for components that passed two tests consecutively; and a test frequency of every ten years for components that passed three tests in succession.

Testing Intervals

- Appendix J Current Requirements
  - Type A Tests - 3 times every 10 years
  - Type B &C Tests - 1 every 2 years
- NRC's Proposed Modification
  - Type A Tests - 1 every 10 years
  - Type B & C Tests - Test on an interval based on the performance history of the equipment

Kevin Christian—slide 3

GGNS Proposed Program

- Test Intervals
  - Type A Test - 1 every 10 Years
  - Type B & C Test
    - Every 2 Years for components that pass 1 test or failed previous test
    - Every 5 Years for components that pass 2 tests
    - Every 10 Years for components that pass 3 tests
- Test Intervals - Additional Considerations
  - Base testing intervals on
    - Engineering Judgment
    - Component Application
    - Usage Factor
    - Testing History
    - Industry Experience
    - System Function
    - Component Size
    - Operation Medium
  - Evaluate all component failures
    - Generic Failures
    - Isolated Failures
  - Evaluate Design Changes or System Operating Changes that could effect characteristics of the components and adjust intervals as required
- Perform as-Found Testing to allow indication of valve performance
- Assign Owner's allowable leakage rates
  - Uniformly to all components
  - Based on size , make, model, and operating characteristics
  - Allows indication of valve degradation

Kevin Christian—slide 4

GGNS Proposed Program (cont.)

- Test Failures
  - LLRT Failure is defined as exceeding the owner's allowable leakage rate
  - If Component fails, adjust interval to every 2 years
  - Test Interval can be extended once satisfactory performance is re-established
- Documentation
  - Component LLRT performance
  - LLRT interval assignment and rationale
  - Allowable leakage rate and rationale

Kevin Christian—slide 5

Other considerations should be established, which an engineer would review in order to establish concrete inspection intervals. These intervals would be based on sound engineering judgment, as well as on a component's application, system function, size, operation medium, testing history, and the industry's experience with the component.

Also, a component should be evaluated both for generic and isolated failures. If a component fails, such as a main steam isolation valve, it may be wise to apply a more stringent testing interval schedule to other MSIVs, if they have the same potential for failing. The idea would be to put all valves with a similar potential for failure on the same stringent test interval schedule as the one that actually did fail. Design or system operating changes should be evaluated for their effects on the overall operating characteristics of a component, and testing intervals adjusted accordingly.

As-found testing should be required to indicate valve performance. Another important indicator could be had by assigning an owner's allowable leakage rate. A leakage rate would be assigned uniformly to each component based on its size, make, model, and operational characteristics. The bottom line is that the allowable leakage needs to be at a point where it will allow indication of valve degradation.

If a local leak rate test fails, exceeding an owner's allowable leakage rate, the test interval should be adjusted to occur every two years. Once satisfactory performance is re-established, the interval between testing can be extended. It is important to have good documentation on LLRT performance history, LLRT interval assignment and its rationale, and on the allowable leakage rate and its rationale.

Advantages

- Advantages
  - No significant impact on safety
  - Reduction of cost which allows resources to be concentrated in areas more significant to safety
  - Increase is system availability
  - Reduction of radiation exposure
  - Reduction of system manipulation
  - Incentives for improvement in leak tightness

Kevin Christian—slide 6

To point out some advantages of performance-based regulation, there would be no significant impact on safety, and costs would be reduced, which would allow resources to be concentrated in areas more significant to safety. System availability would increase. Exposure to radiation would decrease, as would system manipulation. Incentives would rise for improvements in the tightness of valves and other components.

Disadvantages

- Disadvantages
  - Possibility of operating with degraded containment isolation barrier for more than one operating cycle
  - Ability to trend leak tightness and/or anticipate need for corrective maintenance is reduced

Kevin Christian—slide 7

Some of the disadvantages are the possibility of operating with a degraded containment isolation barrier for more than one operation cycle. The ability to trend tightness or anticipate a need for corrective maintenance would be reduced somewhat.

I would like to talk about applying the program I have outlined to Grand Gulf. The Type B and C test interval at the present time is two years. We have a total of 389 components. Under the proposed performance-based program, 33 components

would be tested every two years, six components would be tested every five years, and the remaining majority of our components, which have passed three LLRTs, would be tested every ten years.

Application at GGNS

- Current Type B & C Tests Interval every 2 years
  - Total Components = 389
- Proposed Type B & C Test Interval (Based on Performance)
  - Total Components =
    - 2 Years 33 Components
    - 5 Years 6 Components
    - 10 Years 350 Components
    - Total = 389

Kevin Christian—slide 8

Our Type B and C testing success rate has been 96 percent, and the current L_A for our containment is at 12 percent. In the last three outages, our Type B testing success rate has risen from 95 to 98 percent. Our Type C testing success rate is 97 percent.

Testing History

- Type B & C Testing success rate is 96%
- Current Type B & C maximum pathway leakage is 12% of L_a
- Type B Testing success rate is 95% (98% in last 3 outages)
- Type C testing success rate is 97%

Kevin Christian—slide 9

Figure 4.2.1 provides an overview of the last five outages and our testing results. As you can see, the failure rate has been significantly low throughout all the outages.

Figure 4.2.2 shows our Type B. Testing. In figure 4.2.3 our Type C history is broken down.

Figure 4.2.1
Type B & C Test History

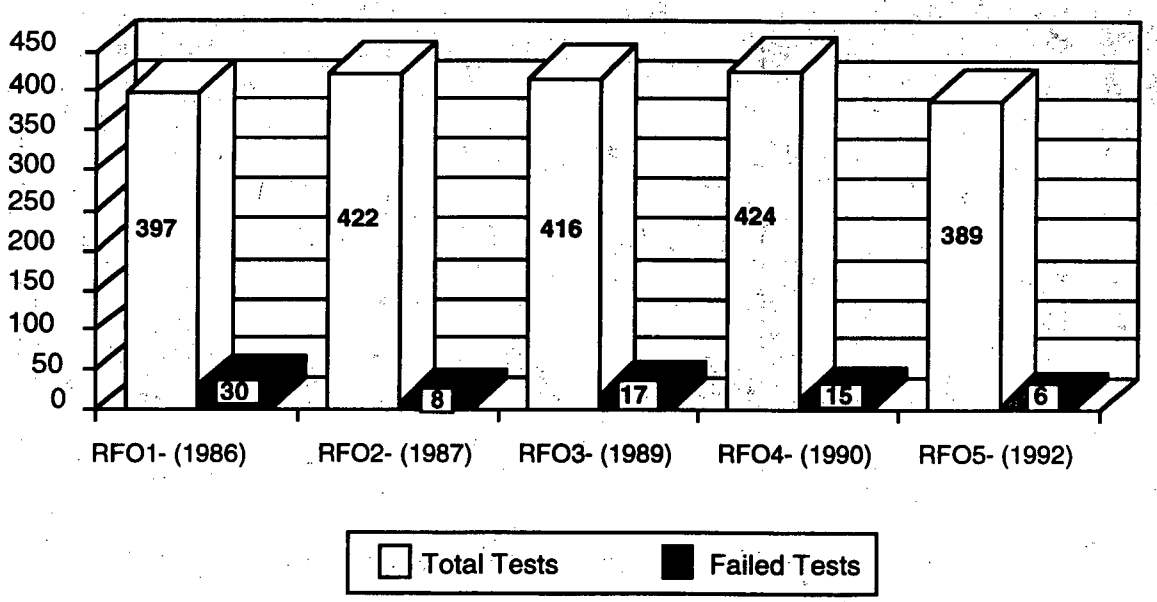


Figure 4.2.2
Type B Test History

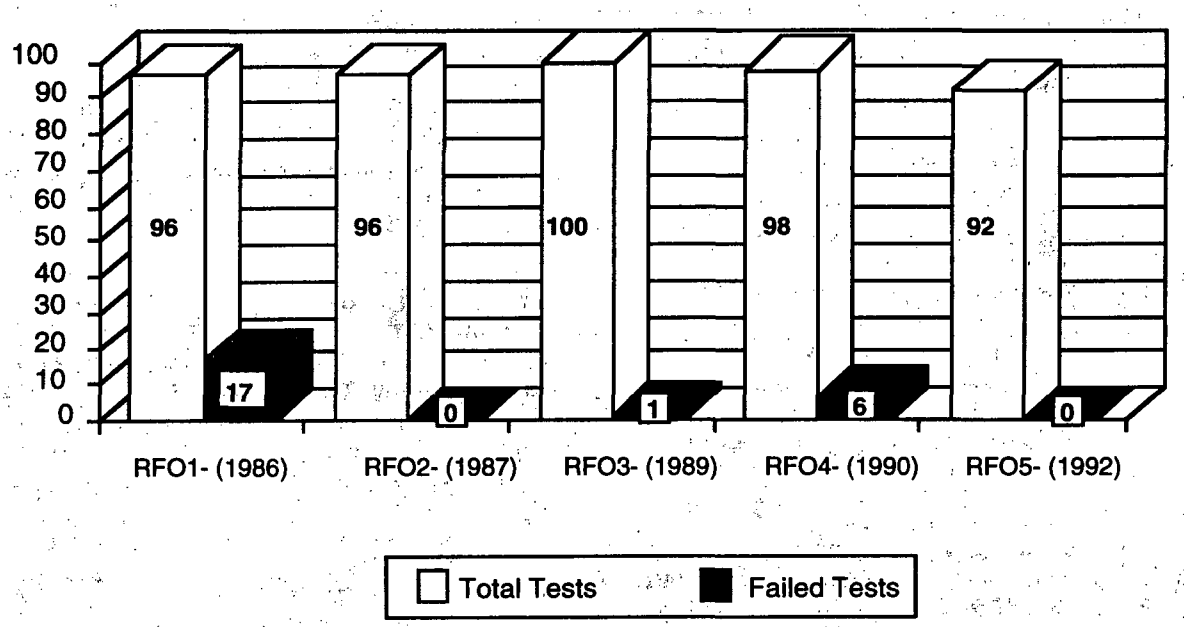
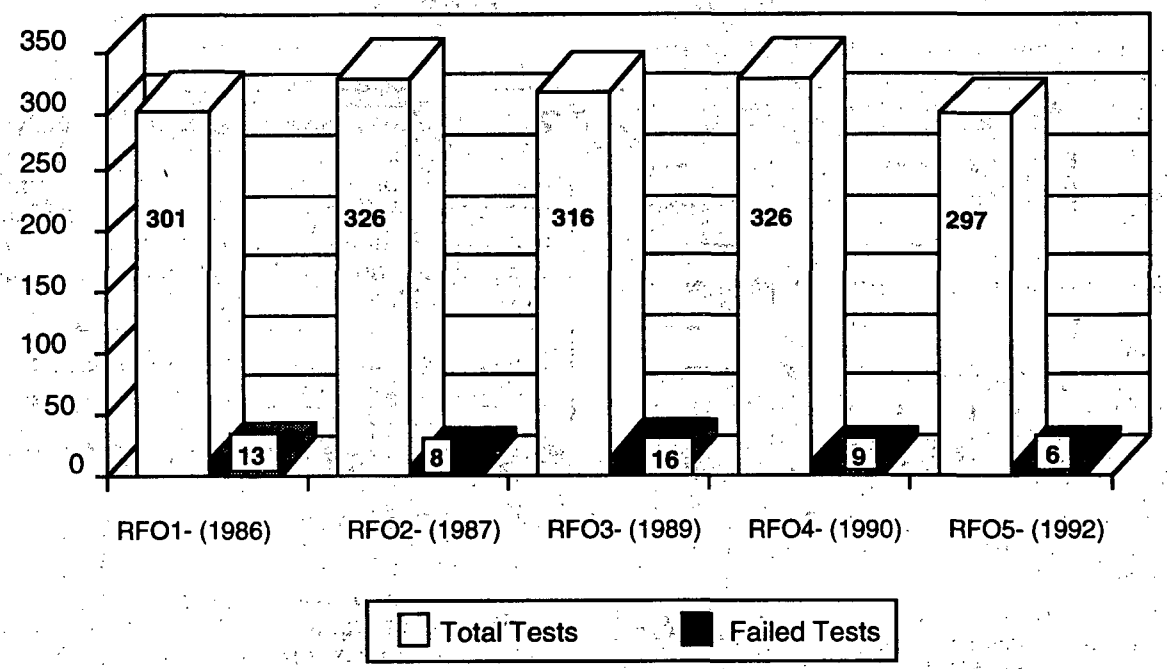


Figure 4.2.3
Type C Test History



Justification

- Justification for Type A Test Interval Changes
  - Failures are usually found on Type C Penetrations which are individually tested
  - Required Containment inspection for structure integrity
    - Appendix J V.A. Containment Inspections
    - New ASME Section XI IWE & IWL Requirements
- Justification for Type B & C Test Interval Changes
  - Continued leak tightness supported by testing history
  - After 3 cycles of testing, problem components have been identified
  - Other programs monitor valve performance and readiness
    - Motor Operated Valve Testing (required every 3 refueling outages per G.L. 89-10)
    - Valve Stroke Testing (required every quarter aby ASME Section XI or O & M Code)
    - Check Valve Program (SOER 86-03)
    - System Surveillances
    - Preventive Maintenance Programs (Component inspections, motor meggering, actuator lubrication)
    - ASME Section XI Pressure Testing

Kevin Christian—slide 10

To explain the rationale for our Type A test intervals, failures usually are found on Type C penetrations, which are tested individually. A visual containment inspection is made for structural integrity before doing a Type A test. For the most part, that inspection will identify any containment structural problems that might jeopardize the containment area.

Also, the American Society of Mechanical Engineers is coming out with a new program called IWE/IWL, whose detailed inspections will provide further opportunities to identify any problems in the containment that may be foreseen.

Type B and C test interval changes are based on a showing of continued leak tightness supported by testing history. After three cycles, problem components have been identified. We know when we go into an outage what areas we are going to need to concentrate on when we are doing our testing.

Other programs that monitor valve performance indicate whether leak tightness is a problem. The MOV testing program is required by Generic Letter 89-10. Valve stroke testing is required by ASME and O&M. Valve function is tested every quarter.

These components undergo a number of inspections other than the Type A, B, and C tests. Check valve programs, system surveillances, preventive maintenance programs are in place to determine if a valve can be relied on to perform its function. Also, ASME Section XI pressure testing is to identify any packaging leakage that also provides a vent or a leakage path for a Type C component.

Cost Analysis

- Contracted Cost
  - Total contracted cost per outage = $530,000
  - Total test each outage = + 389
  - Average cost per test = $1,362
- Total Program Cost Implementation for 10 Years (10 Years = 6 outages)
  - Current 2 Year Interval for all components

    6 outagesx389 testsx$1,362 = $3,178,908
  - Proposed Performance Based Intervals

    (OutagesxTestsxCost Per Test) =

2 Year Interval:	6x33x$1,362 =	$269,676
5 Year Interval:	2x6x$1,362 =	$16,344
10 Year Interval:	1x350x$1,362 =	$476,700
	Total =	$762,720

SAVINGS = $2,416,188

Kevin Christian—slide 11

I will close with some remarks on cost analysis. I looked at our basic contractor cost, and not our makeup or our downtime costs. Currently, we pay $530,000 for outside contract support just to come in and do testing. I used the 389 components that we test every outage, and came up with $1,362 per test.

During a ten-year implementation of performance-based testing, I estimate that we would undergo approximately six outages on a 18-month testing frequency. Our current two-year interval between tests of all components would be adjusted so that the tests occurred over the course of the six outages. There would be 389 tests at an approximate cost of $3,000,178. Applying the breakdown in component testing that I outlined earlier, to test 33 components after a two-year interval, we are looking at a $269,000. To test six

components after a five-year interval, would cost $16,000. To test the remaining majority of components at a ten-year interval, we are looking at a little less than half a million, and a total of $762,000. This would provide a net savings over ten years of a little over $2 million for contract costs alone. Internally, we would save a lot in system downtime, and on internal personnel, but just in outside contractor support, we are looking at a little over $2 million.

4.3 Jim Glover
Commonwealth Edison

I am here to talk briefly about the ANSI 56.8 Standard, and its current status; to point out where it is in accord with the currently proposed regulation, and where it departs from it.

ANSI 56.8

- In June of 1990, the ANSI 56.8 Committee determined that a major update of the 1987 standard was required.
- This update would:
  - Be suitable for use as a requirement
  - Be in general compliance with the proposed Appendix J
  - Address as many Reg. Guide issues as possible
- The major changes in the draft ANSI Standard relative to the existing 1987 version are:
  - Instrumentation Selection Guide (ISG) for the Type A test instrument system was eliminated.
  - The extended ANSI method was added.
  - The correction of LLRT results for instrument error was dropped.

Jim Glover—slide 1

In June of 1990, when the ANSI 56.8 Committee reconvened and determined that an update of the 1987 standard was required, the goal was to make the standard more suitable for use as a requirement. In the past, it had been used as guidance only. The Committee wanted the standard to comply, in general, with the proposed Appendix J, and also address as many of the Regulatory Guide issues as possible. The RG was planned for issue with the proposed Appendix.

Major Changes

- Additional Definitions
- Increased Amount of Information on LLRTs
- Major Changes to the Section on Instrumentation
- Type A Test Data Rejection Criteria Clarified and Improved
- Calculation of Total Containment Dry Air Mass
- Modification to the Standard to Make it Compatible with the Proposed Revision to Appendix J

Jim Glover—slide 2

The major change from the existing version made in the draft ANSI standard was to eliminate the Instrument Selection Guide for a Type A test. We found the ISG duplicated the instrumentation requirements already contained in the standard. The extended ANSI method—the one proposed by the NRC and incorporated into the RG—was likewise incorporated into the ANSI 56.8 Standard. This was done to eliminate the need, within the RG, to take exception to the standard in this area.

The requirement that local leak rate test results be corrected for instrument error also was dropped. We found that the benefits of this requirement were negligible, increasing the workload of people in the plants and doing nothing to increase safety.

We added to the definitions and clarified them, especially in the area of local leak rate testing. The previous revision to the standard was very strong on Type A testing, but very weak on local leak rate testing. We added much information, especially on maximum path, minimum path, as-found and as-left testing requirements.

The Type A test data rejection criteria were improved and clarified to make them more useful. We also added a section on calculating total containment dry air mass, and giving details for that calculation, including correlations for the fluid properties.

We also attempted to make the standard as compatible as possible with the proposed revision to Appendix J.

Current Status of Standard

- The Final Draft for the Standard has been completed.
- This Draft has been voted on and approved by the working group.
- It has recently been reviewed by NUPPSCO.
- Their comments are now being reviewed and resolved.
- If all issues are resolved, then the Standard is expected to be issued this fall.
- The 1993 revision to ANSI 56.8 was in agreement with the proposed Appendix J.
- That revision of Appendix J will most likely never be issued.
- The Standard does not agree with the existing rule.
- These discrepancies include:
  - The duration of the Type A test
  - The intervals between Type A tests
  - The intervals between Type B & C tests
  - Type A test pressure limits

Jim Glover—slide 3

The final draft of the latest ANSI 56.8 Standard has been approved by the 56.8 Committee Working Group and reviewed by NUPPSCO, the committee that presides one level above. We are now reviewing the NUPPSCO comments, and attempting to resolve the issues they raised. We believe we will be able to resolve all the comments shortly, and, if we are successful, the revised standard will be issued in final form, probably this fall.

The 1993 revision of ANSI 56.8 is in agreement with the proposed Appendix J. However, it seems likely that the 1993 revision will never be issued. The Standard is not in accord with the existing rule, with which we will probably have to live with for some time.

The discrepancies between the standard and the existing rule include the duration of the Type A test, the intervals between Type A tests, the intervals between Type B and C tests, and the Type A test pressure limits. Other discrepancies exist, too, but they may be resolved by changes in interpretations of the existing rule.

The Committee plans to proceed with the implementation process of the Standard in spite of these new discrepancies.

The Standard must represent the best technical judgment of the working group.

Jim Glover—slide 4

In spite of these discrepancies, the Committee plans to proceed with the implementation of a revised standard, believing that standards should conform to the best technical judgment of Committee members rather than the current regulations. The draft standard reflects our best technical judgment.

4.4 Mark Hutcheson
Duke Power Company

At Duke Power, I support our three nuclear sites in the containment integrated leak rate testing area. I am here today to discuss some of the differences between the two test methodologies for calculating Type A test leakage; that is, between the BN-TOP total time analysis technique and the mass point technique. I want to touch on the historical context of these techniques, and how this plays out in the proposed rule change to Appendix J.

10CFR50 Appendix J was first introduced for public comment in 1971, and was approved as a final rule in March of 1973. The test code standard ASN 454-1972, which appeared in the proposed rule, was endorsed as the methodology for performing a containment integrated leak rate test.

Meanwhile, the Atomic Energy Commission approved the Bechtel Topical Report in 1972 (revised in November of the same year as BN-TOP-1) which endorsed the total time technique as the proper methodology. Six criteria were set out, which had to be met before a reduced duration or a short duration total containment integrated leak rate test, or Type A test, could be performed.

Both BN-TOP-1 and ASN 454-1972 required data analysis using a total time technique, and in 1981, the ANSI 56.8 Standard was formulated. Later, the containment testing standard was revised to incorporate a mass

point analysis technique. The ANSI 56.8 Standard was revised again in 1987.

The first revision of the proposed rule Appendix J was issued for public comment in October 1986. This version endorsed adoption of the mass point technique to perform a containment integrated leak rate test. The revision was accompanied by a regulatory guide, which allowed for an 8-hour mass point analysis technique, along with some additional statistical analysis methods: specifically, a limit on data scatter and a limit on coverture to allow you to do an 8-hour mass point test.

In 1988, I believe, legal staff members at the NRC recognized some problems with the existing Appendix J—the one approved in 1973. By 1988, most people were doing some form of mass point testing because it was recognized as an approved technique. But Appendix J didn't allow for its use, unless paired with a specific exemption in tech specs. To resolve the conflict in the short term, the NRC amended Appendix J to allow for the use of the mass point technique, but only if used over 24 hours.

BN-TOP-1 Total Time & Mass Point Analysis Methods

Background

- 10CFR50, Appendix J introduced for public comment in 1971.
- ANSI N45.4-1972 specified by Appendix J as acceptable test code method.
- Atomic Energy Commission approved Bechtel Topical Report, BN-TOP-1 in February, 1972 (Rev 1 in November, 1972).
- 10CFR50 Appendix J approved March, 1973.
- BN-TOP-1 and ANS N45.4-1972 require data analysis using the Total Time analysis method.
- ANSI/ANS 56.8-1981 (revised 1987) incorporated the Mass Point analysis method.
- 10CFR50 Appendix J proposed rule issued for public comment in October, 1986 along with companion Regulatory Guide allowing for 8 hour Mass Point analysis.
- 10CFR50 Appendix J amended November, 1988 to allow use of Mass Point technique providing test duration is at least 24 hours.

Mark Hutcheson—slide 1

BN-TOP-1 Analysis Technique

- Minimum test duration for Type A calculation of 6 hours.
- Verification test duration required to be 1/2 Type A test duration plus a 1 hour stabilization period.
- Requires use of Total Time analysis method.
- Leak rate results can vary significantly depending on initial data point chosen.
- Time dependent linear least squares fit.
- Leak rate result calculated at 97.5% Upper Confidence Interval.
- Difficult to satisfy requirements for low pressure ice condenser PWR and low pressure BWR containment designs.

Mark Hutcheson—slide 2

The BN-TOP analysis technique allows you to do a test in 6 hours, that is, the actual Type A test after stabilization. The current mass point technique requires 24 hours. BN-TOP permits a verification test to be done in as short a time as 3 hours. Assuming that you did a 6-hour BN-TOP, the verification would have to be one-half of the Type A test duration. BN-TOP allows only the use of the total time analysis method. No other method is allowed.

Mass Point Analysis Technique

- Minimum test duration for Type A calculation of 24 hours required with current regulations.
- Four hour minimum verification test period required.
- Leak rate results not significantly affected by initial data point chosen.
- Leak rate result calculated at 95% Upper Confidence Interval.
- Accepted by NRC staff and industry as an improved analysis technique.

Mark Hutcheson—slide 3

One of the problems associated with BN-TOP is that the leak rate can vary, depending on the initial starting point. This is because of the difference in methodology used at different starting points.

The one redeeming quality of the BN-TOP is that it tends to be conservative. The leak rate is calculated to have a 97.5 percent upper

compass limit. This conservatism extends to the standard deviation of data and the calculation of a standard deviation that enters into the upper compass limit calculation. However, it is a time-dependent, linear, least-squares fit.

Because mass point analysis must be carried out over a period of 24 hours, a 4-hour verification test period is needed at a minimum. Because the linear, least-squares fit is not time-dependent, if you do vary your starting point, the Type A test results tend to remain the same.

When the NUMARC AHAC Committee was formed, we looked at the proposed rule on Appendix J. As it stands, the rule would permit only the performance of the 8-hour mass point analysis technique. We would like to proceed in the direction of allowing for an 8-hour mass point test with additional criteria, also recognizing that the BN-TOP calculation tends to be, and in most cases is, conservative. If a poor starting point is selected, the result tends to be a higher upper compass limit calculated leak rate than you would get with a mass point analysis.

Because the BN-TOP has been the only short-duration technique approved, many utilities have spent a great deal of money to update and upgrade their instrumentation to allow them to use the technique. Consequently, we would like to see the BN-TOP technique retained as an option for those utilities that can still use it.

At the same time, we would like to proceed to change Appendix J as proposed, and move to allow a mass point test of a reduced duration. Presently at Duke Power, we have four ice condenser units that contain 30 air handling units and include 60 fans, which tend to cycle on and off. It is very difficult to do a BN-TOP test on these units, which is why we would like to have the option to conduct an 8-hour mass point test, instead.

4.5 McCoy Burgess
Pacific Gas & Electric

At Diablo Canyon, we take Appendix J and public safety very seriously. We have a full-time engineer assigned to containment, as probably the rest of the panelists do at their plants. This is a significant cost we bear to meet regulatory requirements.

Leak Rate Testing Cost Factors

- Man Hour Expenses
  - Procedure Development/Maintenance
  - Plant Operation & Maintenance Personnel
  - Contractors
- Personnel Exposure
- Equipment Costs
- Outage Critical Path Time

McCoy Burgess—slide 1

A number of costs are associated with a leak testing program. The first, which is obvious, is man-hour expenses. Plant operation and maintenance personnel are needed to help test, to perform valve line-ups, to vent and drain equipment, to put equipment into place for an integrated leak rate test, and then to bring in contractor personnel during refueling outages to assist with the testing effort.

Another cost that is real, yet hard to put a dollar value on, is personnel exposure, which we the industry are all making efforts to reduce.

Leak Testing Exposure

Outage	mREM
1R1	599
1R2	1349
1R3	3100
1R4	2340
1R5	1461
2R1	956
2R2	1248
2R3	1180
2R4	780
2R5	1033

McCoy Burgess—slide 2

There are the costs of instrumentation, air compressors, and computers. Local leak rate test equipment is a major factor. And perhaps the biggest cost of all is that of outage critical path time—a very critical item for us at Diablo Canyon.

We issue special radiation work permits for local leak rate testing. Different people log into them —these values are as close to exact as we could establish in a reasonable period of time: the duration, the exposure to the local leak rate test, and the integrated leak rate test exposure. This does not cover the time devoted to maintenance personnel and also to operations personnel, but we have had exposures as high as 3 person rem, and as low as 0.6 person rem.

We are working very hard to reduce exposures. Our lowest exposure rate ever is occurring during the refueling outage in progress today. We have spent a lot of money to modify systems to make them easier to test and thus to reduce our exposure time while performing tests.

ILRT Costs

Air Compressors	$60,000
Instrumentation	$85,000
Calibration Services	$26,000
Maintenance Personnel ($45,000)	600 MHrs
Operations Personnel for Valve Lineups ($90,000)	1200 MHrs
Leak Test Personnel	$250,000
Critical Path Time	$2.9M to $4.9M

McCoy Burgess—slide 3

Now to a matter that is near and dear to the hearts of many of you, the ILRT: How much does an ILRT cost? It depends on how you do one, and how much you are willing or able to spend.

During our last refueling outage, we did a very quick ILRT, and we spent $60,000 to rent air compressors. We could have used fewer air compressors at lower cost, but that would have extended our outage time.

We upgraded our instrumentation system, and spent $85,000. We will be able to use that system over the course of multiple ILRTs, but the expenditure had to be absorbed in one fiscal year. Calibration services costs this time were $26,000. We have spent over $50,000 for calibration services to get ready for an integrated leak rate test.

It took maintenance personnel 600 person-hours to align various pieces of equipment and systems. I used a fully burdened figure of $75 a man-hour to calculate maintenance personnel costs. Operations personnel needed 1,200 man-hours to complete their outage tasks during the outage in the current leak rate testing program, and that translates into $90,000: a pretty hefty sum. Just to restore the valve line-up systems to normal status after the integrated leak rate test took eight-man crews 48 hours, working around the clock.

Because Diablo Canyon is a pressurized water reactor, we have fewer penetrations to test than Grand Gulf, a BWR, has. We spend an average of $250,000 for contract leak test personnel during an outage.

For critical path time, we have a performance-based pricing arrangement. Diablo Canyon is unique in the industry—probably unique in the electric utility industry—in that we are paid for megawatt-hours generated. If we don't generate, we don't get paid. Our plant is not built into our rate base. It costs us $2.7 million a day for downtime.

The very minimum local ILRT time that we can bring off is 26 hours, if everything is perfect, and taking into account all of the modifications we have made to reduce the time it takes to pressurize and depressurize containment . That is $2.9 million in critical path time. If, for some reason, we are forced to use the mass point technique for a 24-hour duration test, the time expands to 44 hours, or $4.9 million. That is direct lost revenue.

Obviously, we can't put dollars ahead of public safety, but the fact is that this kind of testing has a very large cost impact. We have done quite a few things to control costs. We have added double compressor capacity, which most people use to pressurize the containment, so that we can save on outage time. We have

added blowdown penetrations to reduce the depressurization time, and the new instrumentation has helped tremendously.

Here is another example of costs: During our ILRT procedure, over 1,000 valves needed to be aligned. It took me 8 hours just to go through the valve lineup and check it against drawings, and I know what the systems look like. Someone has to position those valves before the test, and reposition them afterward.

A smaller number of penetrations is involved when performing a local leak rate test, but we still have to maintain 46 local leak rate test procedures, which must be revised during the annual reviews required by our technical specifications. The procedures must be kept up-to-date with plant modifications.

How good is our testing program? According to our Type B and C testing program, which covers the local leak rates for resilient seals and valves, we have averaged between 0.1 and 0.15 times the allowable leakage of the containment for ten refueling cycles now. The Appendix J allowable rate is less than 0.6 times the allowable leakage rate. So our leakage is very low.

During ten refueling outages, we have never failed a penetration. We have a performance basis for coming into conformity with NUMARC's recommendations for performance-based leak rate testing.

The local leak rate tests often do have a direct impact on critical paths. Maintenance is required on valves during outages—that is, when we are able to do the maintenance without a significant impact on safety. The rules require pre-maintenance testing under certain conditions, so that our local leak rate tests are in the critical path in order that the maintenance can be done. At all times the rules require that at least one local leak rate test be performed when coming out of an outage. Such a test has the potential to enter the critical path at any time.

How are we doing? Very well. We have a database that shows every leak rate test that we have run on our valves. We can show you every time that a valve has failed one of our administrative limits. We are working hard with problem valves to replace those with new valves of a different type. We have made other modifications to reduce the time it takes to drain systems, reduce personnel exposure, and to increase the safety of the containment.

4.6 Steve Bethay
Georgia Power Company

I am speaking to you here today as the Chairman of the BWR Owner's Group Containment Testing Committee, and a member of the NUMARC Ad Hoc Advisory Committee on Appendix J.

We hear a lot about the need to apply a mix of prescriptive and performance-based regulation. Appendix J is an excellent example of where both are needed. That is, we need a general performance-based rule—and I emphasize performance, not just risk—coupled with an ANSI standard, an industry guideline, ANSI 56.8, and an implementation document. We need a marriage of highly prescriptive implementation details in order to arrive at how to test for compliance, and how to determine if we've passed or failed under the umbrella of a broader, performance-based regulation.

Increasing allowable leakage rates, or test intervals is certainly desirable, where it can be justified based on a rigorous technical analysis. But we can't lose sight of the fact that most of the problems we have had with Appendix J through the years have been not so much with the rule itself, but with its implementation.

Through the BWR Owners' Group and NUMARC, the industry has been working with the NRC staff since about 1986 to revise Appendix J. In April 1992, NUMARC identified eleven technical issues that remained to be resolved before the then-proposed Appendix J could be issued.

I want to discuss briefly five of those issues, which we believe can be resolved expeditiously through a dedicated effort by the staff and industry. The first issue, that of as-found testing, is a particularly difficult one for both the industry and the NRC.

Even if we agree that as-found local leak rate testing is appropriate in some cases prior to repairs and adjustments, we believe at least two issues remain open for discussion. First, what is the proper calculational methodology to

use? Second, what are the proper acceptance criteria and reporting threshold?

For all the sets of N-series valves, the NRC has proposed that licensees be required to include the greater of the leakages of any two N-series values in the calculation of the as-found aggregate leakage rate. We commonly refer to this as the maximum pathway leakage rate method.

Because the as-found, actual leakage rate is known, you can test it and know the configuration of a plant. The smallest leakage rate of the two valves is the proper leakage rate for calculating the total pathway leakage; the minimum pathway leakage rate, in other words.

We have been around and around on this issue for several years now, and can attest that this is not an easy question to resolve. We believe that the as-found methodology should be on a minimum pathway basis.

The NRC's approach to establishing criteria for reporting as-found local leakage rate tests for Type B and C failures appears inconsistent with the approach taken in the as-found Type A leakage rate testing.

Under the proposed Appendix J criteria, failure reporting of a Type A test isn't required unless you exceed an as-found value of L_A or 1.0 L_A, and the remainder allowable as-left Type A acceptance criteria is 0.75. In the Type A test, clearly there is a recognition that things do degrade over time. You start off with some margin, and then allow for some change over the operating cycle.

In the proposed revision to Appendix J, Type B and C testing establishes as-left allowable leakage of 0.6 L_A, as it is now, but after an operating cycle also requires an as-found acceptance criteria of 0.6 L_A, not allowing for any degradation in the Type B and C components over the operating cycle, even though, I think we would all agree, that a 40 percent margin is pretty substantial. We believe that the issue of the as-found acceptance criteria for Type B and C testing needs to be addressed and resolved, and that is really the big issue. When to perform and how to report findings on as-found testing is probably the single biggest technical issue remaining to be resolved.

The second issue to be resolved has to do with the allowable grace period for Type B and C testing. The proposed rule states something to the effect that you have to test every two years not to exceed -- or 24 months, plus a 25-percent interval, not to exceed 3.25 times the surveillance interval. This is just how Tech Specs for surveillance testing used to read.

This requirement was added to the proposed Appendix J, largely at my request. Gunter Arndt and I questioned why Appendix J testing should be any different than any other surveillance test. Shouldn't the intervals assigned for that surveillance test be consistent with the intervals assigned for every other periodic surveillance test?

As you know, the 3.25 provision was removed from the Tech Specs in Generic Letter 89-14. It is a minor point, but, for purposes of consistency, we believe interval periods should be the same across surveillance tests. Accordingly, we would propose that the 3.25 criterion be removed from Appendix J.

The third issue to be resolved concerns the potential for Type A test failures due to verification testing deficiencies. This is not caused by an actual problem with a plant, but is a methodological or mathematical problem.

The section that discusses this in the proposed rule needs to be clarified to say that a failure that occurs during the verification test because of a testing deficiency doesn't constitute a failure of the Type A test. The purpose of the test is to confirm that the instrumentation and the data acquisition system is working properly, and although the test is not considered successful and retest is required, if your instrumentation is messed up, the leakage rate criteria shouldn't be considered failed unless you actually had a leak, not just because you had an instrumentation problem.

The last technical issue is that one section of the rule was changed in the revision process from the 1986 rule to discuss deferral of Type A testing for certain containment modifications. Specifically, the section over towards the end has been changed to disallow a deferral of a Type A test for modifications that result in a penetration whose outside diameter exceed one-inch. I think most of us would agree, anything you attach to the containment is probably going to have an outside diameter of one-inch or more.

We would like to see the section revised again to permit a Test A deferral for a well-attaching penetration with a nominal pipe size of one-inch, provided that a local leak rate test has been performed, as well as other nondestructive examination on the weld.

There are other technical issues still to be considered, but those discussed here are the major ones. The BWR Owners' Group is ready and willing to continue to work closely with the NRC staff, the public, and anyone else interested in revising Appendix J. We look forward to fulfilling the expectations of senior NRC and utility managers by demonstrating that a performance-based rule change can be formulated and implemented successfully.

4.7 Walt Smith
NUMARC

I think it is appropriate to take a moment to introduce NUMARC and its mission to the audience here today. Basically, NUMARC is the nuclear industry, including the licensee, NSSS supplier, and the A/E. Such a council was created as an efficient way to work with the NRC to resolve generic issues that affect the industry.

Nuclear Management and Resources Council "Mission"

The Nuclear Management and Resources Council (NUMARC) provides a unified nuclear power industry approach on generic nuclear operational and technical regulatory issues and interacts with the Nuclear Regulatory Commission (NRC), or other government agencies, as appropriate, on those issues.

Walter J. Smith—slide 1

Let me emphasize that NUMARC represents the nuclear industry on generic operational and technical regulatory issues. The council cannot and does not address many of the specific issues that a licensee must deal with on an individual basis.

Because NUMARC embraces all of the industry utilities and all of the NSSS and A/E participants, we have broad and deep expertise to draw on to address not only technical but regulatory issues en masse.

Every licensee is represented on the NUMARC Board of Directors by the chief executive officer, the chief operating officer, or the senior nuclear executive. Policies that affect the industry are scrutinized by very senior members of that industry. When NUMARC marshals its total resources to address issues, it has a very powerful potential to provide the technical expertise to solve problems. Licensee and NSSS participation in NUMARC is 100-percent voluntary.

NUMARC Key Concepts

- The primary interface with the NRC representing the nuclear industry on generic operational and technical regulatory issues.
- Draws upon the collective expertise of utilities, industry organizations, A/Es, vendors, suppliers, and others.
- All licensees represented on Board consisting of either the CEO, COO, or senior nuclear executive.
- 100% voluntary utility licensee membership.
- NSSS vendors and major A/Es are participants.

Walter J. Smith—slide 2

Appendix J Regulatory Development

- Industry supports the NRC objective of a performance-based approach to Appendix J testing.
- A need exists for a regulatory framework to bring to closure industry and regulatory issues.
- NUMARC will coordinate industry input to the NRC regarding:
  - Previous Appendix J Type A, B, and C test results
  - Review and comment on NRC regulatory basis studies
  - Results of EPRI efforts in related areas (most planned activities are in internal development)
  - Development of an industry guideline as an extension of the BWR Owners Group Topical Report
- Consideration should be given to modification of existing regulation as an alternative to the development of new regulations.

Walter J. Smith—slide 3

The industry supports the NRC objective of a performance-based approach to Appendix J testing. You have heard technical and economic reasons why a performance-based approach is appropriate in the industry today. We are looking at an industry and a Nuclear Regulatory Commission that are mature, that have expertise and experience, which have

been used to implement the Appendix J testing. We believe it is time to go forward from the successes we have had.

We believe a need exists for a regulatory framework to bring to closure certain industry and regulatory issues. You have heard a number of the people indicate that we have been working on this since about 1986. We believe that we now have an environment that supports full attention and effort to bring to closure the issues identified.

We believe this closure is important. It is key to the NRC people who have worked hard to resolve these issues. It is key, also, to those in the industry who have expended their resources to come to closure on matters that we think are technically resolvable. We believe it is important that we get an NRC project plan supported by an industry project plan, and public review, and comment, so that the whole process makes sense and comes to closure quickly.

As far as the industry is concerned, our participation in the closure of these issues will be critical because of the import such resolution will have throughout the industry. We can provide support very quickly to the NRC in its need for data to make its determinations, and we will provide that support. The NRC is engaged in a number of studies important to the development of an accurate technical basis for changes to Appendix J. We will support the NRC's studies and provide peer reviews of the findings, offering the input of a very knowledgeable industry.

The NRC has asked if other studies are being conducted that parallel the NRC's efforts to make sure the best expertise is used to close the issues we have identified. EPRI has performed a number of studies related to severe accident management and NUREG-1150, and is prepared to support the efforts of NUMARC. Because the NRC studies are in a very early phase, we can only offer to support them as they develop. We are more than willing to share the results of the EPRI efforts.

One of the keys that the industry has focused on, both in the implementation of the maintenance rule, and relative to the Appendix J rule, is an industry guideline on the methodology for Appendix J testing, which would provide a generic basis for implementation procedures.

We would expect the guideline to be based on the best expertise that exists in the industry. We would expect the guideline to acknowledge all of the pertinent regulatory requirements and be suitable for the NRC to endorse as one method to implement Appendix J testing.

In its preworkshop documentation, the NRC asked us to consider new regulation. We fear new regulation. The rules on the books right now are extremely well understood, both by the NRC and the industry. Even though there are differences in terms of our expectations or interpretations of the rules, we believe these can be reasonably, quickly resolved. Furthermore, we don't believe that the gap between where we are today and where we want to go is extreme enough to warrant construction of a new regulation.

4.8 Open Forum Discussion Summary

Marty Marugg
American Nuclear Insurers:
I have two questions. Question 1: if modifications are made to components, how would this affect the periodicity of Type B/C testing? Question 2: current requirements allow pressure to be applied in the reverse direction between valves in series if the pressure is equal to that which would be applied from the accident direction—would this still be permissible?

Steve Bethay
Georgia Power Company:
I don't have a specific answer but,, with changes in the Type A test requirements, there will likely be an increased emphasis on the local leak rate test program. There will be a need to have a good local leak testing program to justify any changes made to the current requirements.

Kevin Christian
Entergy Operations, Inc.:
There will be a need to prove that pressure applied in the reverse direction is as conservative as pressure applied from the

accident direction. In response to your first question, testing would be required prior to making the modifications.

Jim Glover
Commonwealth Edison Company:
Testing should be performance-based, therefore, test periodicity for components undergoing modifications would be based on prior history of performance.

Gunther Arndt
NRC:
Justifications will be required for any rule changes. There are some licensees who cannot meet the present criteria. The variability in industry leak-test results makes a technical justification for change difficult. I hope the industry does not diminish the importance of protection based only on the fact that the risk contribution from leakage is small. I would like to hear new ideas from industry on new and innovative methods of test methods and not just proposals to relax current requirements.

Walt Smith
NUMARC:
Regarding the comment on data scatter, for the lowest industry performer, 74% of the components tested never fail; for the best performer, this figure is 100%. Industry data is likely to conclude that valves do not fail. Performance-based regulation doesn't mean a relaxation of the rules but, rather is the process that will allow industry to apply resources to areas where the risk is more significant. In addition, there are a number of new ideas that have been used. Most of the improvements are in the area of local leak testing instrumentation that was not available before. Lastly, industry does not want change unless there is a technical justification for the change.

Len Skoblar
Sanford Cohen & Associates:
In view of the comment that there is no technical basis for the existing frequency of Type A testing (3 tests every 10 years), is there a technical basis for the proposed periodicity of once every ten years? Is a frequency of one in twenty years still a viable option?

Walt Smith:
NUMARC
We cannot say today that five, ten or twenty years is the appropriate period. We must examine the technical data and the objectives of the test to determine the appropriate test frequency.

Roger Reedy
Reedy Associates:
The Type A testing was initiated in the 1950s and is a calculational exercise. The results of this test are not meaningful and consideration should be given to eliminating this requirement.

Marty Bowling,
Virginia Power:
Has any consideration been given to testing groups of valves rather than single components?

Steve Bethay
Georgia Power Company:
At this point, there have been no discussions of testing groups of valves at staggered intervals; however, it is an idea that may have merit.

Hershel Specter
New York Power Authority:
The use of risk assessments can result in a win-win situation, where safety is increased and burden is decreased. For example, tests might be improved or increased in frequency for valves that play a risk-significant role, and test interval or allowable leak rate could be increased for less important components.

Neill Howey
Illinois Department of Nuclear Safety:
This group assumes that there will never be another accident. The emergency preparedness perspective must assume that there will be another accident. Although we try to maintain state-of-the-art methods in Illinois, our most difficult job is estimating the source term and who in the general public will be affected by it. Estimation of the source term is easily done if coming from a monitored stack but, extremely difficult if we are trying to estimate the source term from a containment penetration. This is an issue the general public will be concerned about because we are talking about the final barrier that can protect the public. This is a fact that

should be remembered during these discussions.

Charles Turk
Entergy Operations:

The previous comments mis-characterize the industry perspective and how we go about our jobs. However, this workshop pertains to the program of elimination of requirements marginal to safety. Our experience has shown that there are cases of requirements have no impact on public safety, or are excessively conservative—Appendix K is an example. The elimination or modification of these requirements should not be regarded as a reduction of safety or margin, because adequate margin will be maintained to meet regulatory purposes.

5. Fire Protection Requirements

5.1 Gary Holahan
Nuclear Regulatory Commission

The purpose of this session is to discuss fire protection requirements and the potential changes associated with fire protection rules. Although we are here to listen to the various industry and public views on what improvements can be made in the fire protection requirements, I thought it would be appropriate to mention that the NRC staff has found that some features of the fire protection rules may be more stringent than they need to be in some areas and not as thorough as they might be in others.

I would like to encourage this to be not so much a session on how to subtract fire protection requirements as a session on how to balance fire protection requirements, so that any potential change in a rule can mean actual improvements in reactor safety as well as some improvements in efficiencies or reduced burdens on the plants.

Objective: Reactor Safety Oriented Fire Protection Rule

- Appropriate Flexibility
- Clarity (e.g. Role of GL-86-10)
- Covering All Modes of Operation
- Address the Role and Limitations of Fire Watches

Gary Holahan—slide 1.

In a recent study that the staff conducted, we identified a number of areas in which we thought revisions to the fire protection rules were worth raising for discussion. Let me preface this by saying that the Commission has not voted on whether to do this and some senior agency managers have not taken a firm position on whether to do this. Nevertheless, these are general areas where the staff sees it would be appropriate to consider changes.

Because this is an open workshop and we are trading ideas freely, let me bring out a few of them. One is that we do recognize that probably some additional flexibility in the fire protection rules would be appropriate. The fact that the staff has granted so many exemptions to the existing fire protection rules is itself a signal that the rules could have been written differently to embrace the alternatives found acceptable by the staff. Any rule to which there are hundreds or thousands of exemptions probably could have been written so that the flexibility granted in those exemptions could have been built into the rules. We now have more than a decade of experience with the fire protection rule and it only seems logical that we ought to be able to write a better one now than we did in the early 1980s.

The second point is that increased clarity in the fire protection requirements would be desirable. My involvement in fire protection only goes back a few years at which point I was in the position of trying to learn the requirements in the area I was supposed to help manage. I was foolish enough to go back and read the regulation and thought I understood fire protection requirements.

Well, I have come to understand that it doesn't quite work that way. Many basic fire protection requirements do not appear in the regulation but in places like Generic Letter 86-10 and interpretations of that letter. I think there are potential problems when you have rules that say something and interpretations of rules that say something else in other places. After 10 years of experience with a rule interpreted by generic letter and another letter interpreting that letter, and another letter interpreting that letter which, by the way, includes a footnote stating that this latter letter is not an official interpretation, you have to say that there probably is some room for additional clarity in the basic requirements.

The third point is something that has come up in some of our studies on shutdown risk. Fire protection, like a number of other activities, is not dealt with in the same way when a plant is shut down as when it is in operation. The requirements probably weren't thought out carefully in the first place to cover shutdown conditions. We have found that the frequency of fire is about three times as high when the plants are shut down and yet some of the fire protection features—something as simple as

having an inerted BWR containment—simply aren't available when the plant is shut down. So there's an additional feature that could be incorporated into a rule. Certainly the role of fire protection for shutdown could be clarified.

One additional point—and it should be obvious to every power plant that has fire watches these days—is that fire watches are not addressed in the rule. This is so even though both the industry and the NRC recognize fire watches as an important element of the fire protection program and an important element in dealing with difficult issues like what to do with a plant with a degraded fire barrier fire. The rule's silence on the subject is a potential source of difficulty. One of the major elements of the fire protection program is subject to interpretation or misinterpretation because it really hasn't been deal with in the rulemaking process.

Some Technical Issues Not Completely Addressed in the Current Rule:

- Remote Shutdown Testing
- Fire Protection for Shutdown Operations
- Fire Brigade Training + Response
- Self-Induced Station Blackout

Gary Holahan—slide 2.

Additional subjects that could be better addressed by the rule, some interpretation of the rule, or by some other mechanism altogether are remote shutdown testing, fire protection for shutdown operations, and fire brigade training and response. In some of our recent studies, we have noted that the human factor in fire protection may be as much or more important than object elements like fire barriers and sprinkler systems. And yet it isn't clear that the NRC in its requirements or the industry in its implementation has stressed people over hardware systems. We have a more or less hardware-oriented rule that also discusses fire brigades and people, but if we look at safety significance, probably the people are more important. I'm not sure that the balance between people and hardware is the same when taking a risk perspective as it is in the rule.

One rather difficult subject is how plants plan to deal with fires in control rooms or cable spreading rooms. We did a couple of inspections in Region I to try to get a better understanding of how a plant really would deal with such a difficult circumstance. These inspections included the use of plant simulators and actually going through the process of deciding at what point to leave the control room and determining if the operator was comfortable doing that. How the fire protection procedures and the EOPs work together was also discussed. I think this is probably an area that needs to be addressed more directly. It certainly isn't talked about in the rule. There are procedures, but whether they are well integrated with other subjects is not clear to me and is a subject that we would like to study.

As I said at the outset, there probably are some areas where the fire protection rules do too much, or perhaps are too prescriptive, and there are other areas where perhaps the coverage of certain subjects is not as strong as we think it could be. We would like to open a dialogue on fire protection to consider what can be done better and perhaps done in a less burdensome and a more efficient manner at the same time.

5.2 Morris Schreim
NUMARC

Appendix R Proposed Revised Regulation

In October of last year, NUMARC formed an ad hoc advisory committee to examine the current version of Appendix R and to recommend rulemaking revisions. The committee was made up of five utility representatives with broad backgrounds in licensing, fire protection, and plant operations.

In addition, the committee included representatives from EPRI, who understand fire engineering and assessment methodologies, and attorneys from Winston & Strawn, who have firsthand experience with Appendix R, fire protection, and the development of Generic Letter 86-10.

NUMARC Ad Hoc Advisory Committee

- Membership
  - Utility Representatives
  - EPRI
  - Winston & Strawn
- Approach
  - Reflect Exemption Requests
  - Performance Based
  - Maintain Existing Appendix R Structure

Morris Schreim—slide 1

We began our examination by trying to define what intent lay behind the 1,600 requests filed for exemptions from Appendix R. Luckily, many of the requests were summarized in SECY 83-269, but we worked hard with Winston & Strawn to try to define what motivated them.

We tried to identify performance-based regulation and, in doing so, studied Appendix R, the statements of consideration, GL 86-10, the Branch technical position, and associated documents.

In developing our recommendations, we tried to maintain the existing structure of Appendix R to facilitate a one-to-one comparison between what exists now and what was newly proposed. We believed this would facilitate eventual discussions of proposed rulemaking revisions.

Existing Regulation

- Highly Prescriptive
- Intent

Morris Schreim—slide 2

To no one's surprise, we found that Appendix R is highly prescriptive. It is laden with terminology that prescribes, like "three-hour fire barriers", and "8-hour emergency lighting units". The regulation's prime intent seems to be to satisfy GDC-3 by ensuring that a plant can be shut down safely in the event of a single fire.

Staff Assessment February 1993

- Safety Oriented
- Flexible
- Eliminate Confusion

Morris Schreim—slide 3

In February, the NRC staff indicated that any new regulation for fire protection should be safety-oriented, flexible, and eliminate confusion in use. We believe our review and recommendations adhere to that.

Proposed Regulation

- Appendix R Options
  - Option A: Existing Regulation
  - Option B
    - structure
    - performance based
  - Guidance Document
    - prescriptiveness
    - alternatives
- 10CFR50.48
  - Option B - All licensees
  - Change documentation

Morris Schreim—slide 4

In March of this year, we completed a draft of a revised Appendix R and, basically, what we will discuss with the NRC are two options:

- Option A. This is Appendix R as it exists today. A utility would be permitted to elect to continue to be licensed and operate in accordance with the existing regulation.

- Option B. This is a performance-based regulation, which is not as detailed as what exists now. However, it does address the need to shut down a plant safely in the event of a fire. A utility would be permitted to elect this option, instead of the one above.

  Associated with Option B is a guidance document that prescribes what is required to ensure compliance with the intent of the

regulation. As a very simple example, today Section 3-E requires that a fire hose be located outside a plant and hydrostatically tested every year. If a fire hose is located inside a plant, a hydro should be conducted every 3 years.

We believe that this level of prescriptiveness reflects the types of fire hoses that existed at the time the regulation was put in place. However, technology has changed. Today fire hoses exist that do not fail the way they did in the past. They are made of materials that do not require the specific type of testing prescribed in Section 3-E..

Option B would state that fire hoses should be provided and maintained in a condition to provide their intended function. The guidance document would prescribe testing requirements that reflect current technology.

Our ad hoc advisory committee also proposes amending 10CFR50.48. In making this proposal, we suggest that a utility be allowed to elect Option B, either in whole or in part, but also to have to document the deviation being made from the existing regulation and to show how the change will not interfere with meeting the intent of the regulation.

The draft regulation that the NUMARC AHAC is proposing is exactly that: no more than a draft. However, we believe it will take only a very short time for the draft to receive an internal review at NUMARC. Meanwhile, we on the committee would like to sit down with the NRC staff and set up a series of meetings to go through the draft in detail and facilitate any actions needed to ensure full consideration.

5.3 Doug Brandes
Duke Power Company

Taking a prescriptive approach to fire protection made sense in 1980. In the intervening years, fire science technology has developed significantly. Our understanding of fire consequences has grown. Our understanding and use of probabilistic techniques have improved. Now we have the opportunity to take a better approach, and here are some of the subject areas where the ad hoc advisory committee believes changes might be made:

- Key Improvements, Sections 1 and 2. We propose reducing some of the redundancy that results from the fact that the GDC-3 and the Branch Technical Positions ASPCB and CME-B contain many of the same items. We propose to combine these performance requirements and make them internally consistent.

- Exposure fires and direct fires. In our opinion, these need not be singled out and addressed any differently in Appendix R. As the NRC staff correctly determined recently, most power plant fires are caused by plant equipment.

- Repairs. Appendix R does not allow repairs to achieve hot shutdown, and the regulation prescribes what can be repaired. We understand that exemptions from Appendix R have been granted that permit the pulling of fuses. Likewise, other standard emergency operating procedures allow fuses to be pulled. Appendix R should refer licensees to existing emergency operating plans and procedures to determine how to carry out repair operations within their plants.

- Terminology. Appendix R makes interchangeable use of the terms "alternative" and "dedicated" shutdown capability. These terms remain sources of confusion. We suggest it would be better to choose one term over the other and not intermingle them.

- Section III(G). Because it is not possible to specify conditions under which fire will occur, it is necessary to specify design basis protective features rather than design basis fires. Again, we are much closer to being able to predict a design basis fire and its consequences and to deal with the fire more effectively than we used to be.

- Fire brigade training. Requirements currently call for fire brigade training and drills on a quarterly basis. At least at the Duke Power plants, however, it is

the operations people who compose the fire brigade, and they are on five-week rotations. They are in training every fifth week and a 5-week rotation doesn't fit very well into a 12-week quarter. We suggest that more flexibility be permitted in scheduling the training and drills in order to accommodate plant operations.

- Section J. This section speaks to emergency lighting and specifies 8-hour lighting. More specifically—at least this is my understanding—Section J requires emergency lights because, in Appendix R, we postulated that fire would occur and would have to be dealt with, whether or not there was a loss of off-site power.

  When you postulate "with" or "without" loss of off-site power, you literally can't have it both ways. Now that we do safe shutdown analyses and associated circuit analyses, we have the capability and understanding to analyze each area of our plants and to know what systems may be lost and what systems may be available. The thing to do is to proceed on the basis of what you know you will have available, so that you don't have to induce a station blackout because of a postulated event.

- Section L. This the section sets out safe shutdown and performance objectives, among other things. These objectives are included in the station emergency operating plans. There is no need to repeat them in a separate fire regulation.

  In addition, Appendix R requires that a unit be at cold shutdown in 72 hours, or at least that you be able to demonstrate the capability. It's my opinion that the time frame is not as important as taking the time to be sure that you are safely shutting down the plant in an orderly manner.

Key Improvements

- Sections I & II
  - Redundancy
  - Exposure & Direct Fires
  - Repairs
  - Alternative Shutdown Terminology
- Section III
  - G: Assessments
    - Fire Science - Improvements - methods
    - PSA/FIVE Methodology
  - H: Training
    - Performance
    - Verification
  - J: LOOP/Fire Scenario
  - L: Shutdown
    - Time Limit
    - EOP's

Doug Brandes—slide 1

The committee has predicted some cost savings would result from adopting its recommendations, although these predictions come relatively early in our study and may be recalculated later. An example is Section 3 of Appendix R. Section 3 allows fire suppression and detection in areas with a 1-hour, fire-rated barrier. Some of these permissible areas are high in radiation. They are difficult and unpleasant to get to. If you find an area where a 1-hour barrier in and of itself is sufficient, then you shouldn't be compelled to maintain sprinkler or detection systems unless you see a hazard that will affect your unit availability, or create another potential problem.

Cost Savings

- Suppression & Detection System Maintenance
- Fire Hose Acceptability
- Current Fire Watches
- Emergency Lighting Battery Inspection
- Others

Doug Brandes-slide 2

I say this because I know that a number of these areas are very sterile. In some cases, the only thing that will burn are the cables you

might be protecting. To enter these kinds of areas, you have to dress out. There is some dose incurred. There is a time interval during which people must get in and out of the area. You need to have the opportunity to rethink whether it is worth the dose and the effort to maintain these systems if you have other mitigating features.

With regard to current fire hose test requirements, we predict that we would save between 250 and 500 work hours per year in high-radiation areas by going to a test frequency more commensurate with the quality of fire hose that we now use. And that savings does not include the amount of dose we would be spared from absorbing.

Emergency, battery-powered lighting inspection is another item that merits some attention. At Duke Power, the people in our plants believe in emergency lighting. We know we need to have it.

Our concern, however, is that the requirement is very prescriptive. It says you need 8-hour, battery-powered lighting. At the Catawba nuclear station, where we have a two-unit plant, we have a total of 50 emergency lights for the fire protection safe shutdown program. We purchased them with an 8-hour illumination rating, test them once a year per procedure, and what we find is that about 60 percent of them consistently fail this annual test.

Now the 60 percent that fail normally last 6 hours, 7 hours, or even longer. But because they don't meet the 8-hour endurance test, we have to declare them inoperable, take them out of service, and do a prompt repair. This would be fine if we actually needed the lights to operate for 8 hours. In our case, we need them only for a few minutes—a portion of an hour—and, even if they were 1-hour rated, that would give us time to get into the plant, do our job, and get out. There ought to be some flexibility to accommodate this situation.

We calculated that we spend about 30 work days a year repairing these lights just because they don't meet the full duration, and not because they don't last long enough to do the job they were intended to do. There are probably other areas where a rethinking of the current regulation is warranted. The administrative controls program may be a good candidate for re-examination.

Proposed Action Plan

- Final NUMARC Internal Review
- Schedule NRC Discussion Meetings
- Petition for Rulemaking/NRC Assessment

Doug Brandes-slide 3

5.4 Joe L. Burton
Gulf States Utilities Company

PRA and Regulatory Reform

I want to speak with you today about PRA and regulatory reform and specifically about using the fire PRA techniques we are developing in conjunction with EPRI to try to improve the way we handle fire protection at River Bend.

River Bend Station Operating Philosophy

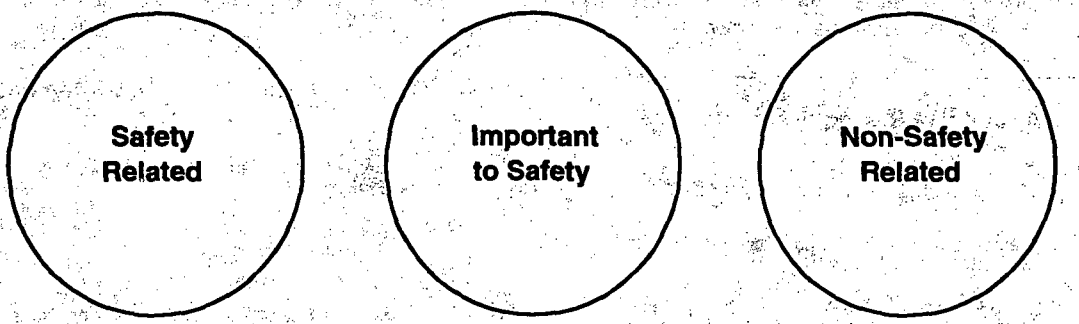
- Safety
- Performance
- Cost Control

Joe Burton—slide 1

The River Bend operating philosophy can be summed up in three words: safety, performance, and cost control. If an activity does not protect the health and safety of the public or our employees, if it does not measurably enhance overall plant performance, or if it increases our operating and maintenance costs without giving us a corresponding benefit in safety or performance, then we are going to examine that activity carefully as a candidate for elimination.

We believe that a safe plant is a reliable and an economical one. To us, there is no conflict among these characteristics; this is a win-win situation. For that reason, we are encouraged by the initiatives that the NRC is taking on regulatory reform and in particular on the marginal-to-safety regulatory program.

Figure 5.4.1
Deterministic Approach

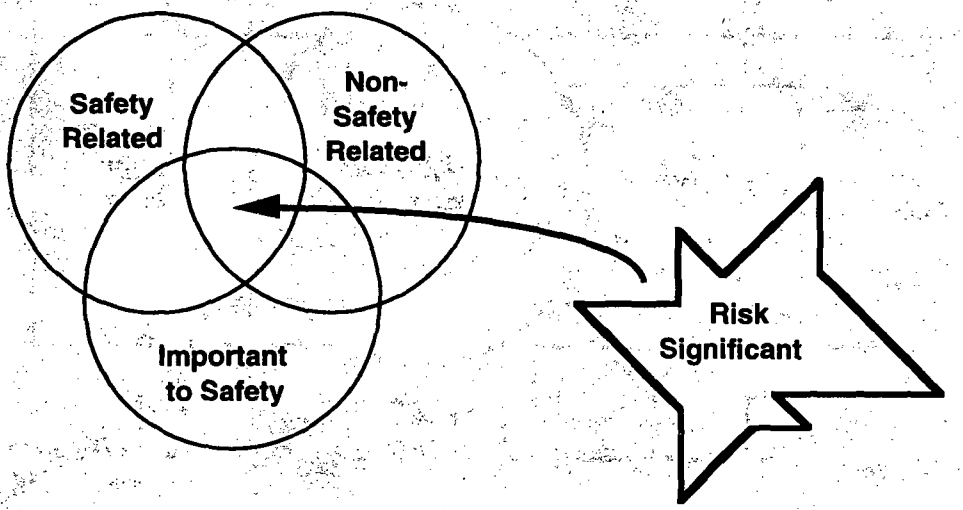


We hear a lot today about deterministic regulations, which categorize plant components as ones that are safety-related, important to safety, and non-safety-related. Over the last 10 years or so, PRA techniques, particularly those developed as part of the Generic Letter 88-20 response, have given us a way to better identify plant components and systems that are really safety-significant. These techniques help tie together the deterministic categories that we already have and to focus on what is actually risk-significant at the plants.

One of our design basis accidents at River Bend, for example, is a large break LOCA with a loss of off-site power and a failure of one emergency diesel. The plant was designed to withstand that event and still stay within off-site dose limits. Because the plant was designed with that DBA in mind, only two-tenths of 1 percent of core damage frequency is attributed to it. In contrast, 86 percent of our calculated core damage frequency can be attributed to station blackout, which was not part of our design basis.

A PRA not only helps you focus on things that really affect your safety, it lets you take some actions to improve your safety. At River Bend, we have identified some fairly inexpensive modifications to reduce, from 86 to 57 percent, the risk that station blackout contributes to core damage. These

Figure 5.4.2
Probabilistic Approach



modifications also will reduce our absolute core damage numbers by a factor of six, so they make the plant a lot safer. This is the sort of thing to use a PRA for: to focus more on what is important and focus less on some of the deterministic regulations out there now.

Appendix R Requirements

- To Prevent Fires from Starting;
- To Detect Rapidly, Contol, and Extinguish Promptly Those Fires That Do Occur;
- To Provide Protection for Structures, Systems, and Components Important to Safety So That a Fire That Is Not Promptly Extinguished by Fire Suppression Activities Will Not Prevent the Safe Shutdown of the Plant.

Joe Burton—slide 2

Appendix R is one of those deterministic regulations. It has three goals: to prevent fires from starting; to detect, rapidly control, and extinguish promptly the fires that do occur; and to protect structures, systems, and components important to safety so that a fire that is not promptly extinguished by fire-suppression activities will not prevent the safe shutdown of the plant.

Generic Letter 89-10, Supplement 4, calls for individual plant examination for external events (IPEEE). As an alternative to Appendix R, the generic letter recommends the use of fire PRA techniques, or of approaches like the EPRI fire methodology, which were developed to meet the requirements set out in the letter.

Generic Letter 88-20 Supplement 4

- Requests Fire PRA or Alternate Fire Vulnerability Evaluation (FIVE)
- Requests Assessment of Fire Risk Scoping Study (NUREG/CR-5088):
  - Seismic/Fire Interactions
  - Effects of Fire Suppressants on Safety Equipment
  - Control System Interactions for Severe Accident Vulnerabilities
- NUREG-1407 Implements IPEE and Requests
  - Plant Specific Assessment of Fire Brigade Training and Effectiveness
  - Assessment of Effectiveness of Fire Barriers

Joe Burton—slide 3

At River Bend, we conduct our fire PRAs by examining the plant on the basis of two criteria. We want to look at the fire areas and fire zones that affect core damage. We also want to look at the areas that would affect spent fuel pool cooling and could lead to a large release from the fuel building. For core damage frequency, we look at three

Figure 5.4.3
River Bend Station

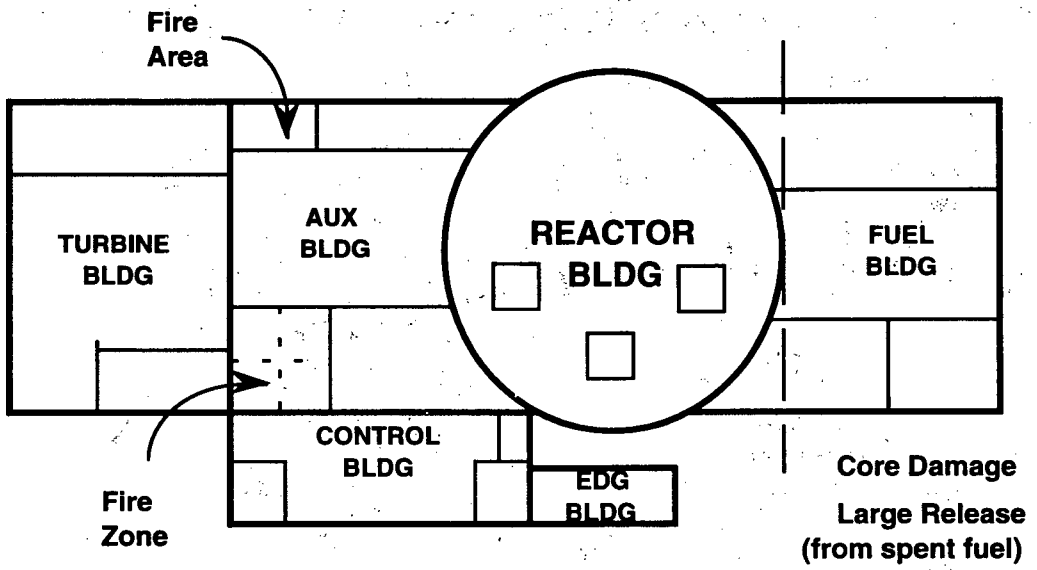
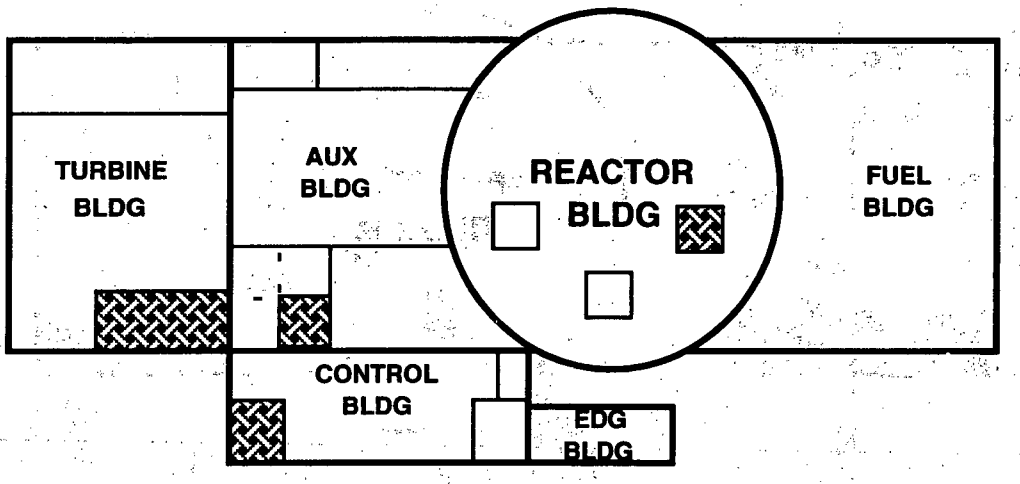


Figure 5.4.4
Fire Zone Screening Process (Typical)



components that are very similar to the criteria that Appendix R asks us to use.

The method that we are looking at makes use of the NRC Level 4 safety goal objective of 1x10E-4 per year for core damage events. We had backed off two orders of magnitude from that, so that our overall core damage frequency criterion for fires is 1x10E-6 per year for a particular fire zone. We carry out a similar process in the fuel building. There we use what we call the "conditional large release probability" and we screen it at 1x10E-6 per year. Eventually, we come down to a large

Figure 5.4.5
Fire Zone Screening Process (Typical)

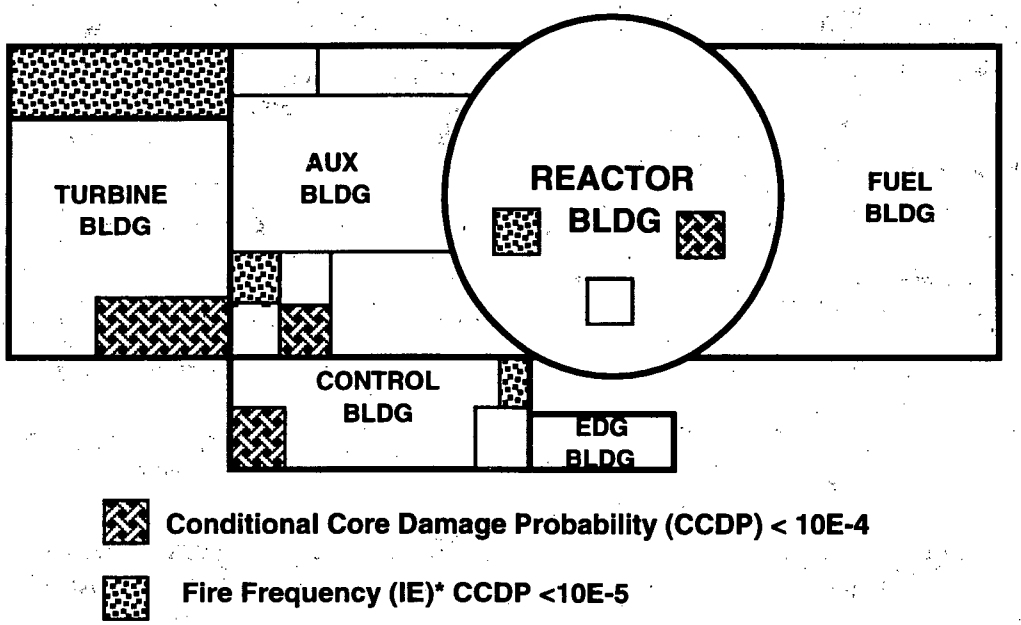
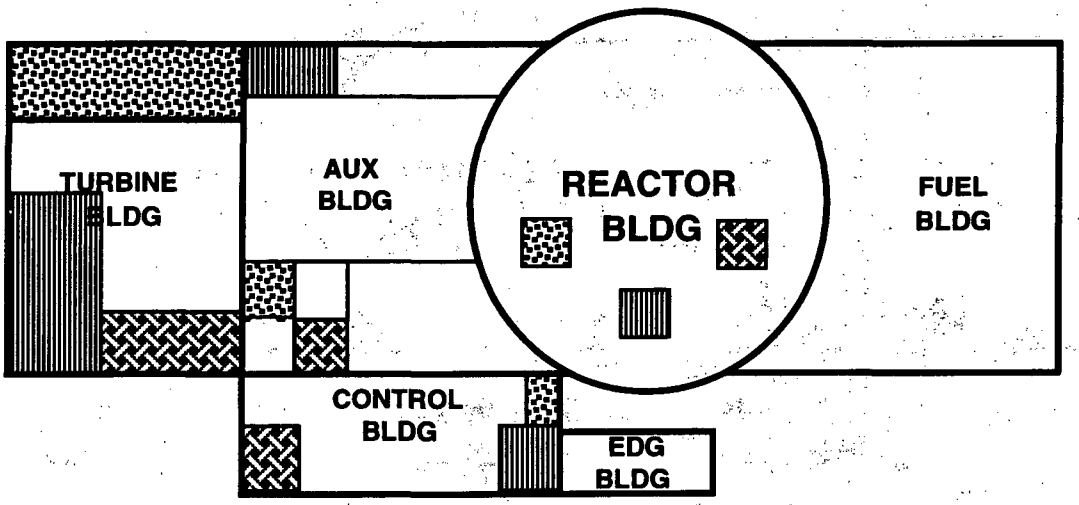


Figure 5.4.6
Fire Zone Screening Process (Typical)



release probability of 1x10E-8 per year, and, again, that is two orders of magnitude below the NRC Level 3 safety goal objective for large releases.

Core Damage Frequency Due to Fires

$CDF = IE * P_{NS} * CCDP$

- Initiating Event (Fire) Frequency (IE)

  = How probable is a fire in a particular area of the plant?

- Non-Suppression Probability (P_{NS})

  = How probable is it that the fire will not be suppressed in sufficient time to prevent damage to risk significant components in the fire area?

- Conditional Core Damage Probability (CCDP)

  = How important to CDF are the systems or components contained in the area in which the fire occurs?

Joe Burton—slide 4

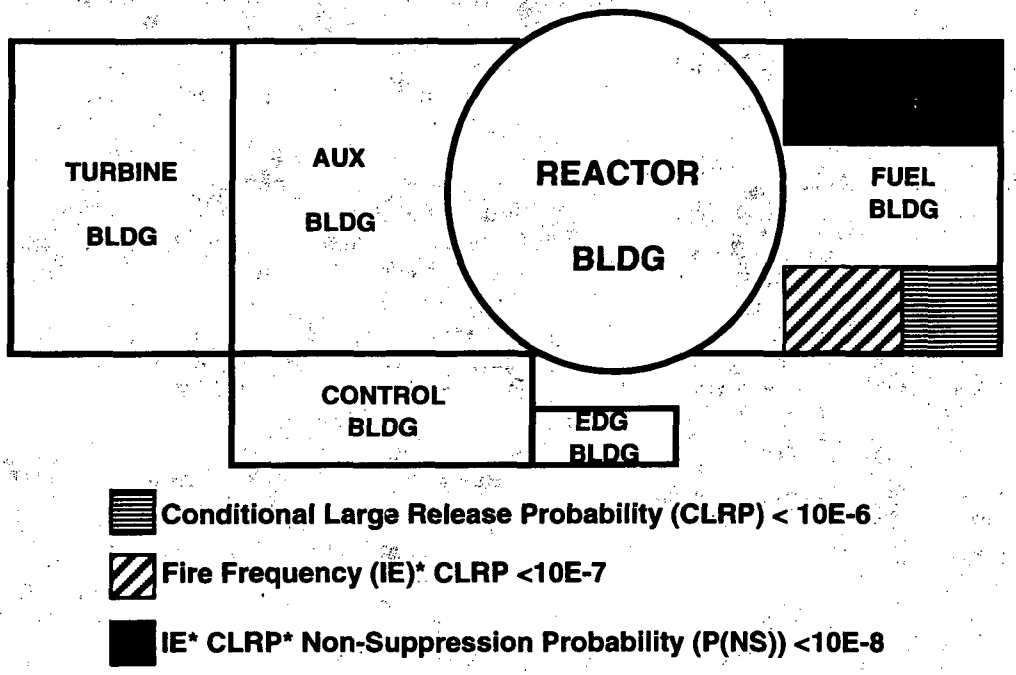
We start out with an initiator frequency. In this case, it's a fire frequency: How probable is it that we'll have a fire in a particular area? We then have non suppression probability: How likely is it that the fire will not be suppressed in a sufficient amount of time to prevent risk-significant components in the area from being damaged? Lastly, we arrive at a conditional core damage probability, which depends on how important systems and components in a fire zone actually are to core damage frequency. Those three factors can be used together to help screen out areas that have no risk significance from a core damage perspective.

Conclusions

- Our primary goal is to operate safely. We can do this with high performance and reasonable cost.
- Appendix R is intended to accomplish the goal of operating safely.
- Risk analysis provides the tool to accomplish all three goals with the rigor that accounts for actual plant fire protection design and practice.

Joe Burton—slide 5

Figure 5.4.7
Fire Zone Screening Process (Typical)



Our primary goal is to operate safely and we think we can do that with high reliability, high performance, and at reasonable cost. Appendix R was intended to make plants safer from fire. With the additional information on PRA techniques that we have received over the years, we believe we can apply fire PRA methods to make our plant safer, more reliable, more efficient, and less expensive to run.

We think these methods are conservative. The NRC's severe accident safety goal is their measure of success, and these methods are consistent with the NUMARC 91-04 guidelines. Instead of hypothetical models, we use a PRA that is based on actual fire protection design and practice and that is supported by about 1,300 reactor years of recorded, fire-related operating history in the EPRI fire events databases.

To comply with Appendix R is not the only reason to use a PRA. I have got a list here of a number of good reasons to use this technique:

- Generic Letter 92-08, which deals with Thermo-Lag. Before you can take any action to reform Appendix R, you have to consider the impact on the Thermo-Lag issue: the two go hand in glove.
- Generic Letter 89-10, which sets out the MOV program. The BWR Owners' Group is taking some initiatives in that regard.
- Appendix J. You can use a PRA to help assess test scheduling on the basis of the scope to be covered.
- Appendix B, you can use a PRA to help prioritize systems, components, and structures for a graded QA program.
- Similar approaches could be used in the environmental qualification area, again focusing on what is important to safety.
- To enhance plant security, you can use a PRA to tell you which plants systems are important to security, and to look at which zones of a plant are important from a security point of view, much as we just did with the fire PRA.

- You can use a PRA in operator requalification training to focus on the types of risk scenarios you could expect at your facility.

Potential PRA Applications for Regulatory Reform

- Generic Letter 92-08 (Thermo-Lag) (Appendix R Reform Must Recognize the Impact of This Issue)
- Generic Letter 89-10 (MOV Program)
- Appendix J (Using PRA for Scheduling, Scope of Testing, etc.)
- Combustible Gas Control (10CFR50.44)
- Appendix B (Using PRA to develop a graded QA Program Based on Risk Significance)
- Environmental Qualifications (10CFR50.49)
- Plant Security Requirements (10CFR73.55) (Prioritizing Risk from Plant Areas, Systems, and Components)
- Operator Requalification Training

Joe Burton—slide 6

Both the NRC and the industry bear responsibility for success in the use of PRAs. To obtain relief from regulation in each of these areas requires acceptance of PRA methods on the part of the NRC staff. That acceptance will only be achieved if the utilities demonstrate a clear ability to develop, implement, and maintain plant-specific PRAs.

If the NRC staff and the utilities do pursue the use of PRAs as part of the regulatory reform program, the regulators, the industry, and the public will see safer and more efficient plants through an integrated approach to safety, performance, and cost control.

5.5 Hank George
Synergy Consulting

Alternate Approaches for Appendix R/Fire Protection

My comments today are based on some experience in the 1970s, when we first tried to get our arms around this issue of alternate approaches to Appendix R, as well as on additional experience into the 1980s, when I helped a number of utilities implement their programs and looked at ways to refine what they were doing in the area of fire protection. My points are made with primary reference to the first two items in the January 1993 Federal Register Notice.

Summary of Proposed Actions - 1/27/93 Notice

1. Modify Appendix R to Allow Use of PRA to Determine FP Features
2. Move Present Protective Measures to a Reg. Guide
3. Endorse Industry Fire PRA Methods in Reg. Guide
4. Allow Compliance with Current Appendix R Requirements to Continue as an Acceptable Method
5. Consider Relaxation of Other Appendix R Areas:
   - Disabling Automatic Features
   - Transient Combustible Load Calculations
   - Loss of Offsite Power
   - 3-Hour Fire Barriers
   - Allowance for Operator Actions
   - Emergency Lighting

Hank George—slide 1

First of all, I do endorse the notion of taking a new look at the fire protection area, and addressing some elements that are marginal to safety. PRA tools offer benefits that weren't available in the early and mid-1970s when we were putting many of the guidelines together. For that reason, I think there could be some benefit in revisiting the regulatory framework surrounding fire protection and taking advantage of the tools we now have at hand.

General Comments

1. Endorse the objective to reduce burden that is marginal to safety, and the approach to use PRA Methods; such methods provide a tool that was not available when present criteria and guidance were developed and implemented.

2. Federal Register notices not accurate on how the fire protection requirements and criteria fit together. Appendix R is not a broad-all encompassing fire protection regulation; GDC-3 and BTP-9.5-1 are intended to serve that purpose. Beyond III.G, J and O, other sections of Appendix R are not creating a burden (they are only applicable to a few plants).

3. Focus on Appendix R for fire protection is too narrow; need to recognize the extent of specificity and burden in the broad range of fire protection "Guidance". Additionally, moving specifics to a Reg. Guide is not sufficient; although alternatives may be proposed to specifics in a Reg. Guide, even addressing an issue in a Reg. Guide elevates the issue to an apparent importance to safety.

4. For Appendix R, need to think broader than just the protective features related to separation; should also reassess (based on importance to safety) positions in "Guidance" that significantly impacted the magnitude of equipment and features relied on for safe shutdown.

5. The issue of transient combustible load assumptions is not expected to provide any particular opportunity for relief from burden.

6. Issues of 3-Hour fire barriers derived from BTP 9.5-1 and from Appendix R, and of 8-Hour capacity for emergency lighting provide some opportunity for relief.

7. Opportunities also already exist to simplify details of docketed programs; excessive details were often provided as the staff, in licensing review, requested details to confirm compliance.

Hank George—slide 2

Some of the comments made at our hearing today, as well as some statements in the January Federal Register Notice, indicate to me a bit of a misunderstanding with respect to the fire protection requirements and how they interface with regulations.

The prime intent of Appendix R was to address a number of issues that remained open after the Appendix A to BTP APCSB 9.5-1 reviews. Subsequent sections, other than the three I note here—III(G), (J) and (O)—did not substantively apply to the vast majority in this room. Each section, like the one on hydrostatic testing of hoses, applied to only one or two plants reluctant to commit to a corresponding aspect of one of the NRC reviews.

The important thing to recognize is that, if we are looking for relief as well as benefit from elements that are marginal to safety, I think what we need to look beyond Appendix R. We need to look at many of the implementing guidelines, things such as Appendix A to BTP APCSB 9.5-1, the Branch Technical Position itself, and various other guidance documents.

Operating Plant Burden/Costs of Fire Protection Program

- Inspection/Surveillance/Testing of Fire Protection Systems and Protective Features.
- Equipment Maintenance.
- Separate Review of Mods, and Procedure and Document Changes.
- Maintaining Fire Protection/Appendix R Documentation.
- Supporting and Resolving Issues from Audits.
- Personnel (Fire Brigade, Engineering, FP Specialists, and Training).
- Special Administrative and Operating Procedures.

{Need to Focus on Opportunities to Reduce Costs from These to Realize Any Benefit from Relaxation of Rules.}

Hank George—slide 3

Generic Letter 86-10, of course, is one such, but a number of other documents also represent the envelope that everyone is trying to operate within. If we are looking for some opportunity for benefit, we really need to address that broad spectrum.

Those segments of the January Federal Register Notice that addressed the possibility of looking at PRA applications and IPE and IPEEE tools to help refine some aspects of fire protection certainly suggest a viable approach. I do think it is important to take a broader look.

With respect to items like shutdown requirements, some of the guidance in Generic Letter 86-10 suggests what needs to be considered as part of your shutdown model.

If we look generally at where plants are spending money, time, and other resources to implement fire protection programs, we will find many items already identified. If we are going to look for different approaches to fire protection, obviously we need to look for alternative approaches in areas where relief is sought.

Approach for Proceeding

1. Maintain option for licensee to elect not to use alternate PRA based approach to compliance (i.e., continue to use current appendix R requirements), and to selectively apply PRA techniques to certain plant areas where safety benefit is marginal.

2. Reduce program and fire protection system detail in guidelines:
   - NRC perform a screening step for criteria/guidance before including in Reg. Guide; i.e., generically test risk contribution.
   - Encourage INPO/NUMARC to develop a guideline that encompasses general fire protection program elements, and a standard for fire protection systems. Use NRC guidelines as starting point, but test need for and sufficiency of guideline; incorporate lessons learned from 15 to 18 years of implementation and from recent fire risk efforts.

3. Simplify shutdown model requirements/assumptions:
   - NRC generically test risk contribution of issue, or benefit from application of requirement, for example:
     - Artificial application of requiring loss of offsite power; address only if fire could cause such loss.
     - One-Hour delay before crediting operator action.
     - Need to consider multiple high impedance faults.
     - Consider hot shorts to be applied continuously.
   - Place guidance for risk significance issues in Reg. Guide.
   - Provide process for alternatives based on plant specific PRA.

4. Allow flexibility in protective features:
   - Similarly NRC should generically test risk significance of present requirements (eg, risk contribution from cabling as an intervening combustible).
   - For protective features determined to be risk significant, include guidance in Reg. Guide.
   - Endorse industry methodology or allow plant specific fire PRA to define appropriate protective features (eg, need for automatic suppression, required rating for fire wraps).

5. Establish process and encourage licensees to streamline program where descriptive details or commitments are marginal to safety and go beyond program criteria or requirements, for example:
   - Remove or change requirements effectively superseded such as by appendix R (eg, commitments on cable coatings, FHA content and objectives).
   - Remove details that go beyond guidelines (eg, penetration seal design details, supplier of particular material).

Hank George—slide 4

For example, if you need to provide a basis for claiming that, during peak temperatures in a fire, you can get by with some lower rating fusible link, the fact that you are required to have a fire protection system, which you must maintain and test, won't help. The extent to which we can use tools like PRA to support such a claim may delineate where we are able to relax requirements.

Recognize that a safety benefit will result from a more focused attention to those issues that are truly safety significant, and freeing resources and attention for other area that can contribute to overall improved performance.

Hank George—slide 5

A component part of any licensee option not to use the alternate PRA approach should be the right to apply PRA selectively within particular plant areas. The reason is that safe shutdown requirements in III(G) of Appendix R apply on an area- or zone-specific basis. If you want to look at risk-based need for those protective features, I think there ought to be an option to do so on an area-by-area basis.

Another dimension with respect to fire protection is the extensive programmatic and system design detail in Branch technical positions and guideline documents that represent engineering judgment as to what were believed to be the right things to do.

Given some of the tools available now, it may be worth reassessing those positions and judgment-based guideline documents. Probably more fruitful, however, would be for us as an industry to encourage NUMARC to advocate compilation of an industry standard based on those documents. Such a standard would enhance interaction on the subject within the industry, and facilitate an update as experience dictates.

Such a standard would reformulate the administrative controls, the control of combustibles, and the extensive detail contained within the guideline documents now. The result would be an industry standard that presented implementation experience gained over the last several years.

The shutdown model offers an opportunity to look at some selected features, using what I think are reasonably good tools at least to look at some comparative risk-type issues. Right now, for instance, some guidance documents require the automatic shutdown of off-site power in the event of any fire in any plant

area. Some requirements should be tested to assess whether the actual risk posed within particular scenarios really warrants a generic application.

Example Criteria

1. For NRC Generic Screening:
   - Does inclusion of the provision substantially reduce risk contribution due to fire, or removal of the provision substantially increase fire risk. Perform this test using fire risk models. This is essentially a sensitivity test.
   - For those issues not amendable to a risk based test, convene a senior NRC staff review panel to pass judgment on the safety benefit to including the provision in the Reg. Guide.
   - For a guideline that is determined to be risk significant, the guideline would be implemented from a regulatory standpoint in much the same *manner as present guidelines.*
2. For Licensee Application of Guidelines:
   - To justify alternatives or an exemption, the standard that must be met for the proposed alternative is that the proposed condition does not significantly increase the risk due to fire. Again this is a sensitivity test, but is one that is based on plant specific considerations. (eg, Does not cause the fire damage frequency for the compartment to be greater than 1E-06/RY; or does not affect the core damage frequencies in the plant PRA.)
   - The program that is subject to NRC inspection would be similar to present programs, but streamlined to those provisions that are determined to be safety significant.
3. Regulation:
   - In such an approach, the regulation would be in the form of performance goals or objectives, such as:
     - Facility design and use of materials to minimize the potential for fire hazards and fire occurrence;
     - *Management controls of work activities to* limit the potential for fire hazards from combustibles or ignition sources;
     - Sufficient systems and resources to assure prompt detection and rapid response to fires;
     - Protection of sufficient equipment and systems to assure that safe shutdown can be achieved.
4. Performance Goals:
   - NRC oversight of programs should focus on performance goals that reflect overall performance of the program. These could include: frequency of fires occurring; brigade and system response to fires that occur; frequency of plant inspections identifying accumulation of combustible material; inadvertent operation of suppression systems; *frequency of program deficiencies.*
   - These parameters may be compared to industry averages to identify outliers, declining performance, and the need for program changes.
   - Appropriate performance indicators allow a shift a shift to more performance based oversight by NRC , and less dependence on strict compliance inspections and enforcement action.

Hank George—slide 7

Within Appendix R, CMEB 951 addresses protected features like 20-foot separations and 1-hour and 3-hour fire barriers where you have redundant shutdown components in the same area. The industry's suggestion that the IPEEE is an option is exactly right. I would guess there are going to be a number of areas where an excessive conservatism in setting particular requirements is demonstrated, similar to what was demonstrated with regard to the exemption requests.

It is important for us to recognize that there are opportunities for improvement in fire protection and relief from requirements without any change in regulation. Many of the details that plague us can be clarified and worked out just through communication with the NRC staff. Let's look at opportunities for relief there.

Finally, let me note that, although the search for regulatory relief or relaxation is perfectly legitimate, to relax the overall objective of fire protection safety is not. What we have to do is to ensure that our resources really do serve those elements most critical to safety. I think that's the thing to look at in the aggregate. The overall safety benefit really needs to be addressed across the board and that includes assessing the benefits of our present priorities.

5.6 Sheldon L. Trubatch
Winston & Strawn

Good afternoon. Like Hank George, I started out in fire protection at the NRC. I hesitate to admit this, but I was the Commission's lawyer who defended Appendix R. Having had to defend it, I readily agree that the rule was not very well written and could have been much better from the outset.

Before I launch into performance-based alternatives, let me just review very briefly why Appendix R is so prescriptive. Appendix R was intended to make some licensees implement the post-Brown's Ferry guidelines. The technical justifications for Appendix R were marginally acceptable, as noted even by the court. And as the NRC's lawyer, I can tell you that the NRC staff did not fully use the material it had available. Because the material presented to the Commission didn't really provide the basis for a flexible approach, the Commission took a very rigid one.

Since that time, we have accumulated a large body of fire protection information. We know much more about how fires actually start in plants. We have approved almost 2,000 exemptions from Appendix R. We know enough to be more comfortable with a performance-based rule than we used to be.

What should a performance-based rule contain? Two basics:

- Safety objectives. These are derived from risk considerations, which is where the PRA will fit in; and
- Inspectable acceptance criteria. And here let me echo that reg guides may be too inflexible. In terms of the rules they set out, they are not that much more flexible when you come down to it.

Performance-Based Approach

II. Elements of a performance-based rule

A. An effective performance-based rule requires two components: (1) clearly-defined performance objectives; and (2) verifiable acceptance criteria.

B. Each performance objective should clearly define the regulatory goal which has been demonstrated to be a necessary component for achieving adequate protection of public health and safety.

C. Acceptance criteria should provide measurable standards by which to demonstrate satisfaction of the performance objectives.

D. Risk assessment techniques have improved substantially and all licensees have conducted extensive risk analysis that were not available when the fire protection requirements were drafted.

Sheldon L. Trubatch—slide 1

I want to make two other observations. It has been suggested here today that the human factor in fire protection should not be overlooked. Yet it is my recollection that one of the major objectives of Appendix R was to make a plant survivable. To focus now on enhancing fire safety seems to be a radical change in philosophy. Also, concern has been expressed about what to do should a fire break out in the cable spreading room. If I remember correctly, that was the Brown's Ferry situation. I mention this because I wonder how much we're going to be reinventing the wheel because we have fresh eyes looking at fire protection and how much we can build on what we've done already.

Performance-Based Approach

I. Background

A. After the Browns Ferry fire, the NRC believed that prescriptive fire protection requirements were appropriate to compensate for the limited experience with fire protection at nuclear power plants.

B. Since then, over 1000 years of reactor operating experience have provided substantially more accurate evaluations of the potential for fire and fire damage.

C. NRC review and approval of over 1600 fire protection-related exemptions show that many of the prescriptive requirements were unnecessarily stringent and could be relaxed.

D. This combination of operating experience and enhanced risk analysis supports the adoption of a performance-based rule.

Sheldon L. Trubatch—slide 2

Key to an effective, performance-based approach is to clearly define your objectives, establish acceptance criteria, and a way to measure their presence or absence that everyone can agree on. Let me provide an example.

I was part of a NUMARC effort in which we were dealing with some water supplies with suppression systems. We began by trying to modify Appendix R to make it somewhat performance-based. I did not start as if there were no fire protection requirements, but tried to focus on the objective, which was to protect the plant from fire. I didn't try to reinvent the wheel. The water supply that is the criterion in Paragraph A was rewritten as a performance objective.

With respect to acceptance criteria, if you have a performance-based objective and some flexible acceptance criteria, you will eliminate requirements marginal to safety. You won't go through your given circumstances point by point, looking for specific items that don't give you the most bang for the buck. You take a much more flexible approach, which lets you meet the performance objective without worrying about whether some particular prescriptive requirement fits your plant or not. If you take this approach, you should automatically eliminate marginal requirements and non-cost-beneficial requirements.

Performance-Based Approach

III. Example.

A. Water Supplies for Suppression Systems

Performance Objectives:

Assure adequate water volume and pressure, with margin, to the main fire loop for all credible fire scenarios.

Acceptance Criteria:

Sufficient redundancy will be provided for water supplies so that adequate pressure and volume will be maintained in the event of a single failure.

Water supplies will be designed so that the failure of the supply will not result in the failure of any redundant supply.

Sufficient water supply to meet the maximum expected water demand as determined by a fire hazards analysis for safety-related areas or other areas that present a fire hazard to safety-related areas.

Where water supplies are also used for other purposes, provisions shall be made to ensure the availability of the minimum volumes shown to be necessary for any credible fire.

Water supplies will designed so that the failure of a supply for non-fire purposes will not degrade the adequacy of volume and pressure for the fire suppression system.

Sheldon L. Trubatch—slide 3

As a result, you have to experience something like an incredible fire to justify return to the Appendix A approach. The PRA type of analysis will be useful to establish what fires are incredible, and at what probability you're going to use as a limit.

5.7 Open Forum Discussion Summary

Paul Gunter
Nuclear Information Resource Service:
The decision to license Comanche Peak Number 2 with Thermo-Lag installed in the plant indicates *de facto* elimination of requirements. I am troubled by the move to non-prescriptive rules when the prescriptive rules have not been followed.

Gary Holohan
NRC:
I appreciate your general comment; however, in the specific case of Commanche Peak, the staff is convinced that the current regulatory requirements are being met by the Thermo-Lag enhancements at Comanche Peak.

Bob Levine
NIST:
NIST, formerly the National Bureau of Standards, has previously developed tools for evaluating fire protection design and performance. Performance standards do exist and performance-based regulation can work. It requires training and a change in perspective by the regulator.

Ken Dungan
President of the Society of Fire Protection Engineers:
Vast strides have been made in the ability to characterize and analyze fires, due to improvements in both science and computer capabilities. Large uncertainties continue to exist, however, the main issue, whether for prescriptive or performance-based regulations, is to determine the objectives and acceptance criteria of the regulation. Previous requirements were established without explicitly defining objective and measures of acceptance, the present effort to formulate rule modifications must reflect this issue.

Judith Johnsrud
Environmental Coalition of Nuclear Power:
The NRC should remember that performance-based rules can not account for improbable actions. Who could predict the candle that started the Browns Ferry fire? or anticipate events that may appear trivial but, in unique circumstances become very significant. The NRC should try to address the issues of highly improbable events and of reducing the consequences of unanticipated events.

Gary Holahan
NRC:
The question is whether your analysis is good enough to encompass unlikely events and combinations of things that you might not have thought of. One test might be to see whether a different set of fire protection requirements would have dealt with the kind of things that really happened in real fires.

Sheldon Trubatch
Winston & Strawn:
As in the case of Browns Ferry, postulating a candle is not necessary to postulate a credible fire and develop effective fire protection.

Charlie Bergeron
Grove Engineering:
The question that develops when discussing modeling is where to start. Should you begin with the consequences of the accident or the initiator? Modeling does not need to cover every possible combination. All that is required is the protection of the critical components. However, you must define what components are considered critical.

Roger Reedy
Reedy Associates:
Prescriptive rules give a false sense of security that all possible combinations have been addressed. Performance-based rules provide a better chance of protecting against unanticipated events.

Ian MacGregor:
The earlier comments by Bob Levine suggest the possibility of a performance-based rule involving a point system, wherein achieving a certain number of points constitutes acceptable performance, thus allowing licensees flexibility in the manner of meeting the requirement. We should also try to keep open the normal regulatory options (e.g., exemptions, operability determinations, etc.).

Jim Ricca
Public Citizen:
You wonder why the public does not trust you? You want to change from prescriptive rules to non-prescriptive rules and do not have any criteria in place to support this change.

Wade Larson:
The original intent of the fire protection rule was to provide a screening basis for identifying the points of vulnerability in a plant. It was the politicalization of the issue that resulted in more prescriptive implementation. The way in which 1600 exemptions have been carefully prepared by the licensees and reviewed by the NRC suggests that the rule has been implemented, in the main, as a performance-based regulation.

Herbert Kook
Entergy Operations:
The discussion of this issue (and others) is carried on with terms and jargon that do not necessarily shed light on the issue. Much of the substance is in the details. What we are trying to do is use out experience over the past ten or so years to identify those things we are doing that do not make a significant difference to safety, and to change them.

Gary Holahan
NRC-Moderator:
Does the concept of performance-based regulation incorporate the performance of fire barriers?

Doug Brandes
Duke Power Co.:
Yes, but the performance requirement for the barrier will be based on specific functional requirements, rather than a generic standard.

John MacGregor:
One approach is to use language like "a fire barrier sufficient to withstand the fire hazards of the area," which is a performance-based approach.

Morris Schreim
NUMARC:
To clarify, we are not advocating any specific method, but rather a combination of whatever methods are needed to protect the equipment.

Fred Maurer
University of Maryland:
The issue of prescriptive vs. performance is somewhat confused, because it is necessary to prescribe the performance. In the case of fire barriers, it is the performance that is prescribed; however, the performance required may be unrealistic, either in the test conditions that are specified or in the acceptance criteria. We now have a much improved ability to address these issues and to avoid some of the ambiguity in such terms as "three hour barrier." The available science provides an adequate basis for performance-based rules. Although uncertainties exist in the analyses, it can be compensated by additional margin or conservatism.

Herschel Specter
NYPA:
This workshop makes use of unfortunate wording. It sounds as if we are trying to eliminate safety regulations when our objective is to improve regulatory efficiency and overall safety.

Joe Bell
American Electric Power:
Our approach is to welcome members of the public onto our discussions of safety to show that we trust them, and thus enhance their opportunity to trust us.

Paul Gunter
Nuclear Information Resource Service:
NRC acceptance of Thermo-Lag, when other materials are out there that can meet the requirements of Appendix R, suggests that the regulations are being ignored.

Ken Dungan:
The claims of competing manufacturers of equipment cannot always be taken at face value. I don't think any of those products could have met the literal test requirements as they were written in 1980. I think we were pushing the envelope, and to sort out the confusion we should go back and evaluate whether the fire protection provides the performance that was the intent of Appendix R—to protect safety systems from fire damage that causes functional degradation.

Alex Marion
NUMARC:
The Thermo-Lag issue is one of compliance, not of fulfilling safety functions.

6. Requirements for Environmental Qualification of Electrical Equipment

6.1 Robert Baer
Nuclear Regulatory Commission

Good morning. I'm Robert Baer, Chief of the Engineering Issues Branch in NRC, and I'm the moderator for this morning's first session on environmental qualification of electrical equipment.

Electrical equipment important to safety must be qualified to perform as specified under conditions existing during and following design basis accidents.

The equipment within the scope of this regulation is established by deterministic criteria.

With few exceptions, equipment qualification must be established by testing.

Maintenance of qualification requires significant effort. It complicates routine maintenance, surveillance, modification, and procurement interfaces for equipment that falls under the EQ rule.

The challenge that we're going to be addressing this morning is to determine whether changes can be made to requirements that would still maintain the ability to mitigate the consequences of an accident during which equipment may be exposed to harsh environments that could cause common mode failures.

Suggested changes to the EQ rule, or EQ requirements range from the use of more realistic source term to establish the environment which the equipment may be subjected to under accident conditions and to the use risk significance to determine which equipment needs to be qualified in the qualification requirements.

There's going to be basically two papers this morning. One has four co-authors and will be given in different portions. Let me introduce Bill Horin, who will be the first speaker on the first paper.

6.2 Bill Horin
Winston & Strawn

I want to begin by thanking the NRC for making this time available to discuss what we feel is one of several important elements related to the topic of reducing or eliminating requirements that are marginal to safety, and we wholly support the NRC's efforts in this regard and intend to work with them and the industry to, hopefully, implement some of the recommendations that we will be making today.

My name is Bill Horin. I'm an attorney with Winston & Strawn, and we are the law firm who serves as counsel to the Nuclear Utility Group on Equipment Qualification, and this is a group comprised of 37 utilities all operating nuclear power plants in the United States, and we have been in existence for going on 12 or 13 years now.

With me on our panel are Steve Hunsader from Commonwealth Edison, Hugh Gelston from Florida Power Corporation, both members of the group, and Phil Holzman, who is President of STAR Incorporated. STAR is the technical consultant to the Nuclear Utility Group on Equipment Qualification.

Purposes

- Consideration of Risk Significance in Application of Environmental Qualification Requirements
  - Incorporation of Risk Significance
  - Apply Realistic Regulatory Principles
- Flexibility in Application of Regulation
- Consistent NRC Regulatory Interpretations
- Eliminate Apparent Significant Resource Commitments for Equipment Qualification Compared to Comparable Activities

NUGEQ—slide 1

I'm going to begin by making a few briefs points so that we can get right into the topics that we want to cover today. We feel that there

are several areas in this regulatory arena for which relaxation can be made available to licensees and options available to licensees that could reduce costs without reducing the relative safety benefit. Let me just make these points, and we'll move right into our program.

First off, the EQ programs that are implemented under 10CFR50.49 require significant resources to both establish and maintain the qualification of hundreds of pieces of electrical equipment throughout the plant.

These resources, in our view, in many cases, go well beyond what is appropriate with respect to the relative risk associated with the performance of that equipment post-accident and certainly well beyond the relative effort that is required to maintain equipment with equal safety significance in other arenas.

In our view, among other things, with the application of risk-significance considerations in the EQ arena, it will provide an opportunity for licensees to reduce the resources that they must expend in this area without reducing the protections for safety-significant activities at the plant.

As you will see from our presentation, most of the areas that we are addressing today and the recommendations that we make in connection with those areas can be accomplished without a change to the regulation itself.

We feel that either a modification or clarification of existing guidance, perhaps additional clarification or direction with respect to the staff's implementation of that guidance, can accomplish many of the goals and recommendations that we are asking for today.

We have seven specific areas that we want to get into, and the other gentlemen on the panel will address those, and I have two of them at the end to address, and we feel that, in these instances—and you will see from the slides that the scope and our recommendations are—we think that these are doable, we think that they are important, and we think that they can reduce the burden on licensees without reducing the safety protections applicable to nuclear power reactors.

Principle 10CFR50.49 Elements

- Equipment Scope
  - Deterministic Criteria
  - Safety-Related, Important to Safety, Certain Post-Accident Monitoring
- Post-Accident Environments ('HARSH" Only)
- Establish Qualification
  - Applicable of Qualification Standards
  - Auditable Documentation
- Maintain Qualification
  - Qualified Life Replacement
  - Maintenance, Surveillance and Procurement Interfaces
  - Upgrade Requirements
  - Design and Field Change Control
  - Incorporate Evolving Information
  - Maintain Documentation

NUGEQ—slide 2

Finally, let me just point out that we also intend to work with the staff and the industry to provide further information to supplement the information and the points that we're are making here today, so that it will help facilitate the ultimate adoption, we hope, of these recommendations.

6.3 Steve Hunsader
Commonwealth Edison

The first topic is long-term post-accident operability. Utilities are currently committed to long-term post-accident operability times that vary significantly between plants, from 30 days to one case that we know of that's greater than one year.

There is no explicit requirement, however current NRC guidance establishes that qualification is necessary for the period of time the post-accident function of a piece of equipment is required.

The risk-significant events that impact the equipment occur during and within the first few days following the accident. With few exceptions, long-term post-accident operability contributes minimally to risk.

Long Term Post-Accident Operability

Topic:	Long Term post accident operability times vary significantly between plants (30 days to greater than 1 year)
Regulatory Basis	No Explicit Requirement
NRC Guidance:	Qualification necessary for period of time post accident function is required
Safety Significance:	Risk Significant event occur during first few days following accident With few exceptions, long term post accident operability contributes minimally to risk EQ Risk scoping study (NUREG/CR-5313) and PRA studies support
Recommendation:	Establish by guidance maximum post-accident operating time for EQ (e.g., 14-30 days) based on actual contribution to risk
Benefits	• Uniformity in management of EQ Programs • Refocus EQ efforts on risk significant issues • Minimize extrapolation of test results (e.g., 30 Day test for 1 year operability)

NUGEQ—slide 3

Radiation-HARSH Only Equipment

Topic:	1. EQ equipment subject to post accident radiation level that are insignificant for relevant materials 2. EQ equipment subject to post accident radiation not significantly different than normal conditions
Regulatory Basis	1. No Explicit Requirement NRC Guidance: Generic threshold of 10^4 Rads suggested (except electronics) 2. Regulation limited to environments "significantly more severe" than normal Staff interpretation of normal high rad environment as "HARSH" regardless of post-accident conditions
Safety Significance	Minimal safety significance: Both topics represent potential adjustments consistent with level of safety contemplated by existing rule
Recommendation:	Clarify guidance to apply radiation thresholds based on component materials Clarify guidance to reaffirm regulatory definition of HARSH
Benefits	Refocus program resources on radiation vulnerable equipment Refocus program resources on original rule intent (prevention of common-mode failures)

NUGEQ—slide 4

A 1989 EQ risk scoping study, NUREG/CR -5313, discusses this. Current PRA studies support this conclusion.

The EQ utility group intends to work with the NRC staff to establish the guidance for a more representative maximum post-accident operating time for EQ, something in the range of 14 to 30 days, that would be based on the actual contribution to risk.

The benefits of this initiative would lead to a uniformity in management of EQ programs, a re-focus in EQ efforts on risk-significant issues, and a minimizing of the need to extrapolate test results via analytical means, which is the current practice; in a sense, taking a 30-day test to establish a one-year operability.

The second topic focuses on installed equipment that is exposed to radiation-harsh conditions only, and there are two parts to this topic.

The first is the case of EQ equipment that is exposed to post-accident radiation levels that are insignificant with respect to the relevant materials of construction.

There is no explicit regulatory requirement regarding accident exposure levels, however current NRC guidance establishes a threshold of 1x10E4 rads total integrated dose, except for electronic components.

The second case deals with EQ equipment that is subject to post-accident radiation that is not significantly different than the radiation conditions the equipment will normally experience.

The regulation requires equipment to be environmentally qualified to environments that are significantly more severe than normal.

Also, the NRC staff interpretation has, at times, established normal high-radiation environments as harsh regardless of the post-accident conditions that may be experienced.

Both topics represent potential adjustments that will allow the level of safety contemplated to be maintained consistent with the rule.

Again, it is the intent of the EQ utility group to work with the NRC staff to clarify the guidance to apply radiation threshold based on component materials of construction, to focus on those materials that require such

attention, and to clarify the guidance to reaffirm the regulatory definition of what constitutes harsh.

The benefits of this will re-focus program resources on radiation-vulnerable equipment, where such attention is appropriate, and to re-focus program resources on the original intent of the rule, which is to prevent the opportunities for common mode failures.

6.4 Phil Holzman
STAR Corporation

The first topic I wanted to discuss was consideration of risk-based qualification levels. This topic addresses the broad application of risk significance to the area of equipment qualification.

Consideration of Risk-Based Qualification Levels

Topic:	Qualification methods and criteria documents uniformly apply to apply to all EQ qualification levels without regard to: • Actual severity of accident environment • Risk significance of equipment
	Burdensome qualification methods applied to risk insignificant events and/or equipment
Regulatory Basis	Regulation establishes qualification criteria for all equipment within equipment scope definition
	NRC guidance provides for uniform methods of qualification within each category without recognition of environment severity or risk significance
Safety Significance	Establish qualification based on actual environmental severity or risk significance
Recommendation:	Modify regulation/guidance to recognize and permit level of qualification to depend on risk significance
	Focus most rigorous methods on risk significant equipment in most severe environments
Benefits	Flexible qualification methods for less safety significant equipment and/or less severe environments
	Reduce ongoing qualification program costs including replacement equipment (schedule and actual replacement)

NUGEQ—slide 5

Currently, qualification methods in criteria documents, such as NUREG 0588, apply uniformly to all equipment within the scope of 50.49 without regard to the actual severity of the accident conditions the equipment is exposed to or the risk significance of that equipment.

For example, qualification by test must include both pre-aging and accident simulations and equipment replacement at the end of its calculated qualified life for both inside-containment equipment exposed to severe loss-of-coolant accident conditions and outside-containment equipment exposed to less-severe short-term pipe-break conditions.

Some of these outside-containment breaks create conditions not significantly different than a short-time exposure to a hot steam bath.

Similarly, the same level of qualification rigor applies to the most risky-significantly safety-related equipment and to substantially less risk-significant equipment, such as some non-safety-related equipment that must not fail in some hypothetically detrimental manner.

The group recommends that the qualification regulations and guidance be modified to vary the level of qualification depending on the equipment's risk significance and the severity of the accident environments to which it is exposed.

For example, some outside-containment equipment exposed to less-severe pipe-break conditions might be designed and tested to demonstrate that the equipment enclosures provide adequate protection from the short-term steam conditions.

For this equipment, a qualified life need not be defined, with replacement and refurbishment based on performance, failure trending, and periodic inspections.

In our view, the most rigorous qualification methods should be reserved for risk-significant equipment exposed to the most severe accident conditions.

The next topic is the application of the revised source terms to existing plants. As many of you know, the NRC has underway a program to revise accident source term definitions for future light water reactors. However, the existing EQ source terms, based on TID 14844, currently apply to existing plants and are unnecessary burdensome to the qualification process because of several unrealistic assumptions.

Application of Revised Source Term

Topic:	Application of existing source term (TID 14844) establishes unrealistic assumption: • Instantaneous release times • "Severe Accident" qualification for all EQ equipment
Regulatory Basis	No explicit regulatory requirement Guidance provides for application of current (TID 14844) Source Term
Safety Significance	Existing source term imposes unrealistic radiation assumptions • Inflexibility inhibits performance *improvements in other contexts* • Performance limits create restrictive criteria (instrument accuracy) impacting plant operation
Recommendation:	Modify guidance to permit optional use of revised source term for environment qualification purposes Differentiate between DBE and severe accident source terms
Benefits	Realistic release times and DBE source terms can permit elimination of equipment form EQ scope Improved instrument radiation accuracy (expanded operating bands) can reduce unnecessary plant trips

NUGEQ—slide 6

First, equipment is presently qualified assuming an instantaneous release of the full accident source term. Yet, fuel failure does not begin for 15 to 30 seconds for large-break LOCAs, and for small-break LOCAs in plants with a leak-before-break analysis, fuel failure would not begin for 10 minutes or longer.

As a result, the instantaneous release assumption creates artificial radiation conditions for equipment functions initially required in response to the loss-of-coolant accident event.

Secondly, the current source terms are indicative of a severe accident, with significant core failure and not the design-basis-event-type accidents for which most of the equipment is designed.

Yet, the performance of much of this EQ equipment that's qualified to the severe accident source terms is only significant for design-basis-type events.

The group recommends modifying the regulations and guidance to (1) permit optional use of the revised source terms for equipment qualification in existing plants and (2) utilizing only those release phases of the revised source terms that represent plant-damage states associated with mitigated loss-of-coolant accidents.

We note that the application of our recommendation has positive implications beyond EQ.

For example, current instrument set-point analysis for protection instruments includes significant instrument errors based on the instantaneous release assumption.

By appropriately recognizing that this radiation condition does not exist when the protection functions are required, the radiation-related error can be eliminated and the plant normal operating bounds expanded. This would minimize challenges to the plant's safety systems and minimize unnecessary trips.

6.5 Hugh Gelston
Florida Power Corporation

I'd like to say a few words about EQ maintenance.

At this time, we are overly conservative in our treatment of EQ end-of-life maintenance. The qualified life calculations are not magic or exact but our best conservative estimate for determining when maintenance is due.

From a risk point of view, there should be considerable flexibility in scheduling. There is an erroneous perception that this conservative estimate is precise. This perception inhibits flexibility in scheduling EQ maintenance.

Our recommendation is that the staff work with the industry to develop guidance in this area. This guidance would be explicit in recognizing that licensees possess the flexibility to identify and adjust EQ maintenance schedules, including the establishment of grace periods.

The grace period could be 25 percent, which would be in line with the grace period allowed for meeting technical specifications.

EQ Maintenance Schedule

Topic:	Overly conservative treatment of maintenance/surveillance
Regulatory Basis	No explicit requirement
Safety Significance	Minimal safety benefit to strict application of recommended EQ maintenance schedules • Qualified life estimates are conservative, subject to some uncertainty • Vendors recommendations conservative • Potential for unnecessary plant excursions
Recommendations:	Explicit recognition in guidance that licensees possess flexibility to identify and adjust EQ maintenance schedules, including the establishment of grace periods Establish generally accepted maintenance grace period (e.g., 25%)
Benefits	Enhance licensee ability to minimize plant operational impacts Eliminates unnecessary extensive analyses to extend maintenance period even for relatively short periods

NUGEQ—slide 7

There is minimal safety benefit to strict application of recommended EQ maintenance schedules. One, qualified life estimates are conservative; two, vendor recommendations, by their very nature, are conservative; and three, there is the potential for an unnecessary plant excursion when some components are taken out of service to perform EQ maintenance while the plant is on line.

6.6 Bill Horin
Winston and Strawn

This topic deals with the application of Regulatory Guide 1.97, which concerns post-accident monitoring equipment, and the application of the provisions of that regulatory guide which recommend that certain of the equipment be qualified pursuant to 10CFR50.49.

The concern here is that, although this is a regulatory guide, the staff has, in the past, only on very rare occasions and often very reluctantly, agreed to allow licensees to demonstrate that there was not a need to qualify a piece of equipment that otherwise, under the categorization scheme of Reg Guide 1.97, would be recommended for qualification.

Regulatory Guide 1.97

Topic:	Staff misinterpretation of regulatory guide 1.97 qualification recommendations as requirements
Regulatory Basis	Regulation references Reg. Guide 1.97, without adopting as requirements category 1 and 2 qualification recommendations However, case-specific exceptions to guidance, demonstrating minimal safety significance, are rarely accepted irrespective of technical merit
Safety Significance	Minimal safety significance demonstrated on case-by-case basis
Recommendations:	Explicitly confirm that licensees may take exception to Reg. Guide 1.97 guidance concerning qualification
Benefits	Exclude risk-insignificant equipment from qualification requirements

NUGEQ—slide 8

This has resulted in the qualification of innumerable pieces of equipment which, from a risk standpoint, contribute little to the reduction of risk.

In addition, the staff has, on occasion, taken a position that suggests that the regulatory guide, simply because it's referenced in a footnote in the regulation, gives it the status of the requirement itself.

As a matter of law, that's incorrect. That is an issue that has been and continues to be debated within the staff, but our recommendation is that the staff explicitly confirm that this is, in fact, guidance; that the regulation directs licensees to apply the regulatory guide and, as with any other regulatory guide, justify exceptions to that guide.

The final topic, which is consideration of leak-before-break in the EQ arena. At this time, the NRC regulatory scheme permits the application of leak-before-break technology for various purposes, including the consideration of dynamic effects as directed by General Design Criterion 4. The staff has already accepted this application of the leak-before-break technology. However, a few years ago, the staff, after considering the potential for applying the same technology in the EQ arena, declined to do so.

Leak-before-Break Application to EQ

Topic:	Equipment required to be qualified to bounding pipe break conditions deemed highly improbable in other contexts • Limited application for EQ (not LOCA or other breaks (e.g., outside containment)) • Arbitrary intermediate breaks not eliminated for older plants
Regulatory Basis	General Design Criterion 4 Generic Letter 87-11 eliminated AIB only MEB 3-1 plants
Safety Significance	Minimal safety impact from application to EQ given current GDC 4 relief for other purposes and consideration already given under revised source term Minimal impact relative to AIB given existing relief for MEB 3-1 plant
Recommendations:	Revise GDC 4 to allow for exclusion of environmental effects based on leak before break
Benefits	Minimize program compliance costs Focus qualification efforts on more likely breaks

NUGEQ—slide 9

At present, there is available to licensees performing qualification relief in the form of applying leak-before-break to your environmental calculations only with respect to the arbitrary intermediate breaks for plants that were licensed using the branch position MEB 3-1. This does not include those older plants who were licensed pursuant to B31.1.

In our view, although the staff permitted licensees, when they declined to explicitly adopt leak-before-break for environmental considerations and allow licensees to seek exemptions, because of the lack of certainty related to the opportunity for licensees to come in with relief in this area, licensees have been reluctant to expend those efforts to demonstrate that it would be justified and seek an exemption.

Whereas, on the other hand, there may nonetheless be long-term benefits from such relief, the initial up-front costs have not been considered justified by licensees.

It's our recommendation that, particularly because the technology itself has been accepted in the NRC regulatory scheme, the leak-before-break technology and its application, that there is and should be no safety significance to extending that to equipment qualification.

This has already been done in the dynamic effects arena. Licensees were among the last to address, obviously, the effects of a leak as opposed to the pipe break, but yet that will be something licensees can do in accordance with what would be a more certain regulatory environment than what is present now.

Then, finally, as perhaps a measure that can be taken very quickly, the staff, in Generic Letter 87-11, had provided the arbitrary intermediate break relief to apply leak-before-break in that arena for equipment qualification only to the MEB 3-1 plants.

It's our understanding that there was an effort underway to extend that to the B31.1 plants. For reasons that were not technical (more resource-based), that effort was not completed. We would recommend that the staff go ahead and complete that particular effort.

6.7 Robert Tjernlund
Sargent and Lundy

We believe that, for the nuclear power industry to remain a viable energy supplier, it must do three things.

To Remain a Viable Energy Supplier, the Industry Must

- Improve the availability and reliability of our plants/systems/components
- Assure that safety margins are not compromised
- Improve our $$ competitiveness

This requires change...

However

The current EQ regulatory requirements are a significant disincentive

The costs to:

- Qualify new components
- Introduce improved materials
- Apply technological advancements

are prohibitive

Bob Tjernlund—slide 1

First, it must go ahead and approve the availability and the reliability of plants, systems, and components; second, we must assure that safety margins are not being compromised; and third, we must go ahead and approve our cost competitiveness. This requires change. However, the current regulatory requirements—and this morning, I specifically refer to those that pertain to EQ—provide a significant disincentive to this change.

However, the cost to qualify new components, to introduce improved materials, or to apply technological advances in our plants are prohibitive.

I believe that one contributing factor to this is that the current EQ regulations and guidelines discourage use of anything but full sequential testing to establish the qualification of new and replacement components.

The Current EQ Regulations and Guidelines Discourage the Use of Anything but Full Sequential Testing to Establish Qualification

- "Replacements must be qualified in accordance with these provisions..."-10CFR50.49
- "The test sequence should fully confirm to the guidelines established..."-NUREG 0588 2.3 (1)
- "Experience has shown that qualification of equipment subjected to an accident environment without test data is not adequate to demonstrate functional operability. In general the staff will not accept analysis in lieu of test data..."- NUREG 0588 2.1 (2)
- "Qualification by analysis or operating experience ... may be found acceptable...These methods are most suitable for equipment where testing is precluded by physical size of the equipment being qualified. It is required that when these methods are employed partial tests on vital components of the equipment be employed."- NUREG 0588 2.4

Bob Tjemlund—slide 2

For that, I quote three sources. First is 10CFR50.49, which says that replacements must be qualified in accordance with these provisions unless there are sound reasons to the contrary; second is out of NUREG 0588, which says the test sequence should fully conform to these guidelines established, and it refers to IEEE 323; and thirdly, again out of NUREG 0588, is experience has shown that qualification of equipment subjected to an accident environment without test data is not adequate to demonstrate functional operability. In general, the staff will not accept analysis in lieu of test data.

The Net Result Is

- Economics force utilities to stick with what's qualified and avoid anything new
  - Stock piling of obsolete components
  - Continued use of marginal but qualified products
- Vendors have little incentive to
  - Enter or stay in this market
  - Qualify new products
  - Improve existing products
- The industry is becoming locked into old technology

Bob Tjemlund—slide 3

There are three results:

First of all, economics forced the utilities to stick with what's currently qualified in order to avoid anything new. In fact, utilities are currently stockpiling obsolete components so they will have available replacements.

Also, we see the continued use of products that are really marginal or less than optimal from a system design standpoint, but they're qualified, so we use them.

Second, we see this in the fact that vendors have little incentive to enter into or stay in this market, to qualify new products, or to even improve their existing products.

As evidence, a couple of years ago, we tried to encourage two vendors to come in and enter in the market for self-contained HVAC damper actuators. It took one year to convince them that they would have a reasonable return on their investment, and basically, they all entered in the qualification process and dropped out. They just said it's not worth the effort.

In the utilities, we constantly hear, "you guys are 5 percent of our business but 95 percent of our problems; we don't want to deal with you."

The net result is that industry is becoming locked into old technology. That's evidenced by the fact that our fossil plants use much more sophisticated and more reliable

components sometimes that we even have in our nuclear plants.

Recommendation

The regulatory guidelines should be revised to encourage the use of engineering analysis based upon lessons learned from 14+ years of cumulative EQ research, testing, and operating experience.

The staff should encourage actions to apply this 14+ years of cumulative EQ research, testing, and operating experience plus the wealth of knowledge accumulated by other (non-nuclear) industries to

- Quantify the factors affecting an item's ability to function under adverse (harsh) conditions
- Identify proven ways of addressing these factors
- Quantify how aging stressors (principally radiation and temperature) affect the properties of specific materials
- Establish the limits of our knowledge base and use this information to minimize the EQ burden

Doing this will do much to eliminate the disincentives to change

Bob Tjemlund—slide 4

To address this issue, I recommend that the regulatory guidelines be revised to encourage the use of engineering analysis based upon our lessons learned. We've got 14-plus years of experience in cumulative EQ testing, research, and operating experience. This would permit us to take advantage of these lessons learned to focus our limited resources on finding new and better ways, materials, and products, rather than simply confirming what we already know.

To accomplish this, the staff would go ahead and encourage actions to apply this 14-plus years of experience in research and testing, to possibly go ahead and quantify the factors that affect an item's ability to function under adverse or harsh conditions, identify prudent ways of addressing these issues, quantify how aging stressors affect the properties of specific materials, identify what we do know and also establish the limits of our knowledge; then take and combine all this and use this knowledge to minimize the EQ burden.

Doing this, in my opinion, will do much to eliminate the disincentives that currently exist towards change.

6.8 Open Forum Discussion Summary

Jack Jirowsek
Niagara Mohawk:
With regard to the idea of a grace period for maintenance, scheduling maintenance should not be a problem for end-of-qualified-life maintenance, where the period might be ten years. For shorter turn around cases, I support the idea.

Phil Holzman
STAR, Inc.:
The central point is that the uncertainties are such that delays of a few days are not risk significant. Greater flexibility can avoid unnecessary efforts on justification of equipment operability.

Jack Jirowsek
Niagara Mohawk:
With regard to taking into account the protection afforded by enclosures and different qualification requirements for more remote equipment, you already have some of that available if you define the environment closely enough.

Phil Holzman
STAR, Inc.:
We are referring not only to the environment, but to the fact that the same rigorous and difficult qualification methods that are required for equipment in risk significant applications are also required for equipment in less risk significant applications. We're suggesting that, for certain classes of equipment, depending on the severity of the environment and the significance of the equipment, that the rigorous methodologies need not apply, and we can apply a more graded or less onerous approach in terms of cost and yet achieve the same benefit.

Bill Horin
Winston & Strawn:
We recognize that one may be able, in some instances, to properly interpret the regulations and guidance to provide flexibility. However, not all utilities have been willing to do that, for a number of reasons—oftentimes because of uncertainty with respect to the staff positions in their particular region or because of their

knowledge of such uncertainties elsewhere. We're looking for some explicit staff positions that will eliminate the variability of implementation.

Charles Turk
Entergy Operations:
Deficiencies under EQ programs are treated differently than are deficiencies in other design requirements, such as seismic. We use different enforcement policies and reporting requirements for EQ. We need to establish a more open dialogue with regard to treatment of EQ in design. I also would like to know how the changes we are discussing will be made, and where; whether leak-before-break is a closed issue, and how will we address the issue of aging, which I have referred to as voodoo engineering.

Bill Horin
Winston & Strawn:
Depending on the issue, the changes under discussion might be required in a rule, a Regulatory Guide, or in staff positions and interpretations. Although there is a Commission decision on leak-before-break, we recommend the issue be revisited. The uncertainties in aging issues argue in favor of greater flexibility in the application of regulatory requirements.

Bob Tjernlund
Sargent and Lundy:
The current approach to equipment qualification discourages the introduction of improved technology.

Wade Larson
Engineering and Program Management:
The current EQ requirements and staff interpretations were developed in an era when it was necessary to focus attention on this issue. Given the changes in the industry and licensee operations and EQ programs over the last 10-15 years, should we be looking at another framework and approach to EQ regulation.

Phil Holzman
STAR, Inc.:
The advanced light water reactor program would be a place to look for evidence of innovative approaches, but it appears that the current methods are being applied there also.

Hugh Gelston
Florida Power Corporation:
Some of the conservatism in the implementation of the rule has developed through interpretations by inspectors.

Steve Hunsader
Commonwealth Edison:
What we are looking for is the difference between sound engineering practice and what we do as result of rigid implementation of prescriptive interpretations of the rule.

Roger Huston
TVA:
The "one size fits all" methodology for testing does not allow for the application of technical judgment where engineering information exists to permit extrapolation. There is no willingness to accept technical judgments unless the position is fully backed-up by testing information. Also, much information has been gathered on survivability of equipment during seismic events and should be incorporated in EQ analyses.

Ralph Goodel
Florida Power:
The framework in place is the result of regulators adding new regulations as a club over industry, rather than using existing processes to effect the desired improvements. Industry and NRC must work cooperatively on the implementation process.

Joan Etzweiler
Consolidated Edison:
Two items are important considerations for equipment outside containment.

1. This equipment is more accessible and can be reached after an accident to perform repairs and inspections. Also the severity of the environment outside the containment is less than for equipment inside containment.

2. End-of-qualified-life does not happen all at once for this equipment and there is a need for flexibility in replacement intervals.

NOTE:

Although this session was to address issues for environmental qualification of electrical equipment, several commentors suggested that Seismic Qualification Utility Group (SQUG) data and guidance should be used beyond its original scope for resolution of USI A-46 and be disseminated and applied for use in equipment qualification programs, as applicable.

7. Requests for Information Under 10CFR50.54(f)

7.1 Steve Lewis
Nuclear Regulatory Commission

As Senior Supervisory Enforcement Attorney in the OGC, I frequently counsel the staff regarding the use of various mechanisms, including the use of 50.54(f) letters. I also review proposed 50.54(f) letters before they are sent to the CRGR.

The staff and the Commission are very interested in hearing the views of the panelists and the audience regarding 50.54(f) and suggestions for improving this regulation. This is an important mechanism for the staff that stems directly from the statutory provision allowing the NRC to request information necessary to determine whether enforcement action should be taken against licensees. This mechanism is used quite a bit by the staff.

Recently, the Commission has undertaken a number of initiatives to further control the use of 50.54(f) and require the staff to justify their use of the requirement.

In 1991, the CRGR charter was changed, and all licensees were notified of this change. In any 50.54(f) submittal to the CRGR, the staff was required to state that no other requirements were being imposed by the letter other than the requirement under 50.54(f) to respond and provide the information requested.

Since that time, the Commission has modified the process as follows: in almost all cases, public comments will be sought and factored in before these generic communications are issued, and the Commission will be consulted regarding the generic communications before they are published for public comment.

Perhaps these initiatives answer a number of questions that people have regarding 50.54(f). I presume there are still concerns that members of the audience have about the regulation, and we would be delighted to hear them today.

7.2 Daniel F. Stenger
Nuclear Utility Backfitting and Reform Group

In response to the February 1992 solicitation of comments on the marginal-to-safety program, we expressed concern about the use of information requests issued under 10CFR50.54(f). Our concern was that some requests in the past had imposed a significant burden on licensees without a systematic analysis of the safety benefit and cost-effectiveness of the request.

Introduction

- NUBARG comments (May 4, 1992) expressed concerned that "information requests" issued under 10CFR50.54 (f) have placed significant burden on licensees without systematic analysis of safety benefit and cost-effectiveness.
- NUBARG recommend revisions to 50.54(f) to make consistent with Commission's stated intent in 1985 backfitting rule that significant requests for information be carefully scrutinized and, in general, be subjected to cost-benefit analysis under 50.109.

Daniel F. Stenger—slide 1

NUBARG recommended revisions to section 50.54(f) itself to make it consistent with our reading of the Commission's stated intent in the 1985 backfitting rule that significant information requests be carefully scrutinized and, in general, be subjected to the cost-benefit analysis required by section 50.109.

Let me expand on that with some background. The information request process in 50.54(f) was substantially revised in 1985. At the same time, the Commission modified the backfitting rule, 50.109. At that time, the Commission explained in the rulemaking that its revision of 50.54(f) was intended to ensure that information requests were "not unduly burdensome" and to provide the NRC "management control and accountability" over the information request process.

Information requests under 50.54(f) do not require the same degree of justification as is required under 50.109 for an actual backfit.

Background on Use of 50.54(f) Information Requests

Information request process revised in 1985 in conjunction with revision of backfitting rule.

- Section 50.54(f) revision intended to ensure that requests were "not unduly burdensome" and to provide for NRC "management control and accountability" over the information request process (49 Fed. Reg. 47034, 47035).
- Information request does not require same degree of justification as required under backfitting rule. Rather, the showing required is that "the burden imposed by the information request is justified in view of the potential safety significance of the issue to be addressed."
- Commission expressed "strong concern" that extensive information requests "be carefully scrutinized by Staff management," and in cases where it is not clear whether a backfit might occur, "those cases should be resolved in favor of [backfitting] analysis" (50 Fed. Reg. at 38102).

Daniel F. Stenger—slide 2

Under 50.54(f), the NRC staff must show that the burden imposed by the request is justified in view of the safety significance of the issue to be addressed. In contrast, 50.109 calls for a cost-benefit assessment of proposed backfits.

Concerns with 50.54(f) Information Requests

- Use of "information request" creates confusion over whether NRC actually intends to backfit implementation of requested actions or merely wants information.
- Some requests impose new Staff positions interpreting requirements. Examples:
  - Generic Letter 89-04, IST of Pumps and Valves
  - Generic Letter 89-06, SPDS Criteria
- Through requirement to respond, can effectively impose new regulatory requirements or mandate continuing programs. Example:
  - Generic Letter 89-07, Vehicular Bombs
  - Generic Letter 89-10, MOV Testing
  - Generic Letter 89-13, Service Water System Testing
- Require extensive new analyses, using criteria not reflected in licensing bases, to generate requested information. Examples:
  - Generic Letter 88-20, Supp. 4, IPEEE
- Imposed to verify/maintain compliance even when licensees previously founding compliance or where requirements not applicable to all plants. Examples:
  - Generic Letter 89-13, Service Water System Testing (GDC 44, 45, and 46)
  - Proposed Generic Letter on Augmented ISI for Mark I and II BWRs (GDC 16, 50 and 51)

Daniel F. Stenger—slide 3

In the backfitting rule, the Commission also expressed strong concern that extensive information requests be carefully scrutinized by staff management. Where it is not clear whether a backfit may result, "cases should be resolved in favor of the backfitting analysis under 50.109."

In short, the concern with 50.54(f) is the potential for bypassing both the rulemaking process and the disciplined cost-benefit process required by the backfitting rule. More specifically, some of the concerns with 50.54(f) that have occurred in the past are as follows.

First, using an information request can create confusion among licensees as to whether the NRC actually intends to backfit implementation of certain requested actions or merely wants information. You are left in doubt as to whether a new program is being called for—even plant modifications—or whether you are merely to send information.

Secondly, there have been requests in the past that have imposed new staff positions on the interpretation of regulatory requirements. Examples are Generic Letter 89-04 on IST of pumps and valves and Generic Letter 89-06 on SPDS criteria. In our view, issuance of a new staff position on the interpretation of requirements comes under the definition of a backfit and should be treated under 50.109.

Thirdly, through the requirement of 50.54(f) to provide a response, the information request itself—issued as a generic letter or possibly a bulletin—can effectively impose new regulatory requirements on licensees or make it clear that the NRC intends that some program, often of a continuing nature, be implemented. Examples are Generic Letter 89-10 on MOV testing and Generic Letter 89-13 on service water testing.

Another concern is that some requests require an extensive analysis of the plant using new criteria not reflected in the plant's licensing basis. IPE and IPEEE are examples. I don't need to tell the licensees in the audience how much those efforts have cost to implement and the burden that they impose.

Finally, another concern is that in some cases where the information request has been imposed to verify or to maintain licensees in compliance with existing regulatory

requirements, the requirements cited do not necessarily apply to the plants covered by the request. I'll give you an example. An augmented ISI for Mark I and II BWRs on the corrosion of steel line containments was treated as a compliance matter in a proposed generic letter, the basis being the three General Design Criteria. Most Mark I plants are not GDC plants; they are pre-GDC plants.

As many of you may know, in a Staff Requirements Memorandum issued by the Commission in September 1992, the Commission very clearly stated that plants that predate the General Design Criteria are not required to comply with the GDC.

Burden of Information Requests

- Information requests have imposed significant burdens on licensees. Examples:
  - Generic Letter 89-10, MOV Testing—implementation costs in range of $6M or more per plant
  - Generic Letter 88-20, Supp. 4, IPEEE—multi-million dollar analyses
- 36 major Generic Letters and Bulletins issued between October 1988 and present. NRC estimate of response burden alone was from 21,630 to 35,130 person-hours per plant (exclusive of implementation costs).
- NRC has adopted improvements in generic communications process: Commission notification and public comment prior to issuing generic communication stating new Staff position or seeking additional licensee commitments (SECY-92-224).

Daniel F. Stenger—slide 4

I won't dwell too much on this in terms of the burden of information requests, but it goes without saying that the MOV testing provisions of Generic Letter 89-10 and the IPEEE have both been multimillion-dollar efforts to implement.

We have looked at some of the major generic letters over the past 4 years or so. In counting 36 of those letters, the NRC has estimated the response burden—the burden of simply preparing the response—to be from 21,000 to 35,000 person-hours per plant. Let me emphasize that estimate is only for preparing the paperwork to respond, and does not include the burden of implementation of the requested actions.

Major Generic Communications October 1988 to March 1993

Type	Number	Response Burden*	50.109 Analysis
Generic Letters	27	13,950 to 17,950 mhrs	7
Bulletins	9	7,680 to 17,180 mhrs	0
Totals	36	21,630 to 35,130 mhrs	7

* Based on NRC estimates. In general, does not include cost of implementation of requested actions.

Daniel F. Stenger—slide 5

The NRC has adopted improvements to the generic communications process. There was the revision of the CRGR charter, the staff's recommendations that went up for Commission notification and public comment prior to issuance of a generic communication stating a new staff position or seeking additional licensee commitments. We believe those improvements have been very useful, but it is still worth addressing some of these concerns.

As far as I know, the NRC has not withdrawn any of the generic letters that I just mentioned. Many of those are still being implemented today, and there certainly will continue to be generic letters and bulletins issued in the future.

NUBARG Suggestion for Revising 50.54(f)

- NRC should raise threshold for issuance of information requests: require determination that concern actually represents a potential safety issue for all plants covered by the request.
- Modify language of 50.54(f):
  - For requests intended to verify compliance, require explicit identification of existing regulation or other provision of licensing basis for which verification of compliance is sought.
  - Requests for new programs or extensive plant analysis to be processed under the cost-benefit standards of the backfitting rule (50.109).

Daniel F. Stenger—slide 6

Our specific suggestions for modifying the 50.54(f) process were as follows.

Raise the threshold for issuance of the information request, that is, determine whether the concern addressed by the request actually represents a potential safety issue for all the plants that are covered. Sometimes, a request

has covered plants for which the issue did not apply. A little better work on the front end to identify whether there is a safety concern at all plants covered by the request could reduce the burden on those for which it does not apply.

An example is the proposed generic letter I mentioned earlier on augmented ISI for Mark I and Mark II plants. The corrosion concern may well not have applied to many of the plants that would have been covered by the proposed generic letter.

We recommended two specific language changes to 50.54(f), as follows.

First, for a request intended to verify compliance, the staff should be required to provide an explicit identification of the existing regulatory requirement, regulation, or other provision in the current licensing basis for which verification of compliance is sought. In other words, the staff should carefully focus on precisely what regulatory requirement they intend to verify compliance with.

Secondly, where the request involves implementation of a new program or an extensive plant analysis using new criteria, 50.54(f) should cross-reference 50.109 and require that those actions be justified under the more rigorous standards of the backfit rule.

Suggested Language for 50.54(f)

To accomplish these changes, NUBARG recommended in May 1992 comments that 50.54(f) be modified as follows:

Add new third and fourth sentences to read:

"Where the information is sought to verify licensee compliance with the current licensing basis, the staff will identify the specific regulation or other provision of the licensing basis for which verification of compliance is sought. Where the information request would result in the establishment of a new program, including testing or analysis, or an extensive study using new criteria, in order to develop the information required, the provisions of 10CFR50.109 will be followed."

Daniel F. Stenger—slide 7

The language we suggested is given in Slide 7. In terms of implementing changes coming out of this workshop, we are hopeful that the NRC will treat the comments as a petition for rulemaking and consider whether or not to make the modifications that we suggested.

Basis for NUBARG's Suggested Approach

Consistent with the goals of the marginal to safety program—i.e., will minimize the potential for extensive information requests that do not produce a significant safety benefit commensurate with the burden imposed.

- Reduces excessive regulatory burden
- Require better technical justification for new Staff positions or requests for new programs
- Comport with Commission policy on proper scope of 50.54(f) information requests as expressed in 1985 backfitting rule.

Daniel F. Stenger—slide 8

The basis for our comments is very much in line with the purpose of this workshop; more careful scrutiny of proposed information requests before issuance, as the Commission intended in the 1985 backfitting rule, will minimize the potential for extensive requests that do not produce a safety benefit commensurate with the burden imposed.

This will reduce excessive regulatory burden, require better technical justification of requests before they are issued, ensure that the more objective and rigorous standards of the backfitting rule are applied, and comport with the Commission policy in the 1985 rule.

There is another issue I would like to bring to the attention of the people in the audience and the NRC. In June 1992, there was a recommendation issued by the Administrative Conference of the United States, which is a body that makes recommendations to the Congress and to Federal agencies on implementation of the Administrative Procedure Act. That recommendation, 92-2, which is codified in Type 1 Section 305.92-2 of the Code of Federal Regulation, is very interesting. It addresses the used agency documents that are neither issued as binding regulations nor issued through the rulemaking process to impose new requirements.

The Chairman of the Administrative Conference is Robert Anthony. He wrote an article that was published in the Duke Law Journal in mid-1992. I'd like to read an excerpt from that, because I think it's very much to the point.

He says, "The use of nonlegislative policy documents [meaning anything other than a rulemaking issued under notice and comment rulemaking procedures] generally serves the

important function of informing staff and the public about agency positions and in the great majority of instances is proper and, indeed, very valuable." We don't disagree with that.

He goes on to say, "But the misuse of such documents to bind where legislative rules should have been used carries great cost. Affected members of the public are likely to be confused or misled about the reach and legal quality of the standards the agency has imposed.

"One consequence of this uncertainty can be that affected persons are unaware that the agency intends to give its nonlegislative issuance binding effect. Probably more often, though, the private parties realize all too clearly that the agency will insist upon strict compliance but conclude that there is little they can do to resist."

The Administrative Conference went on to make basically three recommendations.

1. Nonbinding documents should not be used very often; rather, the rulemaking process should be used.

We do not quarrel with the need to issue generic letters and bulletins from time to time. When such nonbinding documents are used, the Administrative Conference suggests the following:

2. The agency must maintain an open mind, i.e., be amenable to alternative actions or alternative schedules proposed by the affected parties.

At the risk of sounding negative, I would suggest that the treatment given to IPEEE responses is an example of the agency or some regulators not maintaining an open mind. There has been quite a lot of debate about holding people to some rigorous schedules. More of an open mind in that area would be consistent with what the Administrative Conference has recommended.

3. Establish an informal process for affected parties to appeal from the nonbinding document.

That would mean the opportunity for an appeal from the requirements of 50.54(f). There is the backfitting appeal process under 50.109, which may apply to many information requests, but not necessarily. In our view, licensees should have an opportunity to make an informal appeal from that request on the grounds that the potential safety significance for their plant does not justify the burden of responding, that the issue addressed is not really an issue for their plant, or that there are other reasons why they don't need to respond.

In terms implementing such a process, it may be useful to modify the NRC's management directive on the plant-specific backfitting process to include an informal appeal process from 50.54(f) requests.

7.3 Robert W. Bishop
Nuclear Management and Resources Council

In this workshop, we have been discussing a number of regulations and certain regulatory approaches that have the promise of reducing or eliminating regulatory burdens when the benefits are not commensurate with the cost. Our panel will provide our perspective on the use of 50.54(f). My comments will focus on a discrete but very important aspect—generic communications.

We have been given a very effective analysis of the past, some noteworthy examples, and a vision of the future. I would ask you to keep that in mind.

Relevant Statutory Authority

- Atomic Energy Act Section 161(b)—to "establish by rule, regulation, or order, such standards and instructions...as the commission may deem necessary or desirable to promote the common defense and security or to protect health or to minimize danger to life or property."
- Atomic Energy Act Section 161(p)—to issue "such rules and regulations as may be necessary to carry out the purposes of this act."
- Administrative Procedure Act Section 553—Requires agencies to provide notice and comply with other procedural requirements for substantive rules.
- Atomic Energy Act Section 181—the Administrative Procedure Act "shall apply to all agency action taken" under the Atomic Energy Act.

Robert W. Bishop—slide 1

What I want to do now is go back a step to make sure we're all working from the same foundation. I want to focus on the present—

how the process works, what it really means, what a generic communication really is, what the responsibilities really are.

It may be a bad habit, but every once in a while lawyers go back and look at the law. Some suggest we do it more often, some suggest we do it less often, but anyway, I went back and looked at the law.

I should put your minds at rest. I am not going to give you a test as you leave to compare and contrast 161(b) with 161(p) of the Atomic Energy Act. I would suggest to you that is a terribly exciting and thrilling exercise to contemplate, but no test will be given.

The bottom line is that rules and regulations—and those are the only things with which licensees in a regulated environment must comply—be adopted in accordance with the Administrative Procedure Act.

Utilization of Generic Letters, Information Notices and Bulletins

- Generic Communications—to communicate NRC's position on generic issues.
- Information Notices—Alert licensees to an event or condition the NRC believes may be important to safety.
- Generic Letters—Similar in purpose to INs but generally address situations of greater significance than INs.
- Bulletins—Issued when the NRC believes the situation is important to safety, timely action is necessary, or timely information is needed by the NRC to assess the situation.

Robert W. Bishop—slide 2

Generic communications are mechanisms used by the NRC to communicate its position on generic issues. Three different mechanisms currently exist, although I saw a note yesterday indicating that another mechanism is being proposed for consideration—an administrative letter, which apparently would replace a generic letter. I do not know the purpose, prospects, intent, scope, or use of the administrative letter. However, I know that it is another type of generic communication, which means it is not a rule, it is not a requirement, it is not something licensees have to do—with one small exception I will come to in a moment.

As previously mentioned, the Commission issued an SRM on December 20, 1991, which directed the staff to involve the Commission and to solicit the views of interested parties and groups prior to the issuance of generic communications that would articulate a new staff position and seek licensee commitments. These were new requirements. That is the process currently in place.

Section 50.54(f)

- To request either the submittal of information or a confirmation that certain actions have been taken.
- To enable the NRC to determine whether or not a license should be modified, suspended or revoked.
- Except for information to verify licensee compliance with its current licensing basis, NRC must determine that the burden imposed upon respondents is justified in view of the potential safety significance.

Robert W. Bishop—slide 3

The one exception to the statement that generic communications are not rules or requirements is any communication that cites 50.54(f), which requires licensees to respond. Responding is your requirement, whether or not you agree with the staff action that is recommended, requested, suggested, or advised.

Generic communications cannot require you to do anything unless they cite 50.54(f), which requires you to respond. You must tell the Commission, based on the information in the generic communication, what you intend to do, if anything.

I would suggest that within that requirement is the opportunity for you to not only tell the Commission what you intend to do, if anything, but also to state your intended schedule. You can provide a helpful explanation of why you have chosen your intended action or why you think it is not appropriate for you to take the recommended action, and the reasons behind your intended schedule.

The NRC has to evaluate the burden imposed by the requirement, except for the burden imposed by requiring information to verify licensee compliance. In the future, we're going to ask more frequently to look at the regulatory analyses to ensure the accurate assessment of the imposed burdens.

The scenarios that were presented as examples are an indication of a very serious resource burden. It is my view that a very careful evaluation has to be made in each case to ensure that the burden is justified by the benefit sought.

Legal Analysis

- None of the Generic Communications are rules of general applicability within the meaning of the APA.
- Section 50.54(f) requires that a licensee respond—It does not require that the licensee conduct any activities "recommended" or "requested" by the NRC.
- The fact that a Generic Communication may cite Section 50.54(f) does not convert it into a binding requirement.

Robert W. Bishop—slide 4

As I have mentioned, generic communications are not rules or requirements promulgated in accordance with the APA, and therefore are not binding.

Conclusion

- Licensees may be required under Section 50.54(f) to submit a response to the NRC, but no action other than responding is required.
- A licensee is free to make whatever commitments it believes are appropriate, and may establish an alternate schedule and describe actions it intends to take other than any or all of the actions recommended or requested by the NRC.

Robert W. Bishop—slide 5

I believe that the law is clear. The issue that most of you must deal with in the day-to-day, practical world is: What do you do?

I have had the opportunity to work for a utility for 10 years. That has given me an understanding of what really goes on. I know that the common response is to submit to the NRC's request, even if you don't believe that it's appropriate. I would suggest that you keep in mind the fundamental responsibility that you have for the plant and for its operations, because you're responsible under the license, not the NRC. The NRC is responsible to ensure you do your job right, but your license holds you directly responsible.

My advice is: Don't do anything that you do not believe is justifiable for your plant, recognizing that you are going to have to defend that decision. If challenged, the NRC has the authority to issue an order and start an order-to-show-cause proceeding to determine whether your license should be suspended, revoked, modified, etc. Of course, the NRC can do that at any time. They may take such action if they think you are being unresponsive to a generic issue addressed in a generic communication if they feel the issue is significant and affects the public health and safety.

To take such actions, there are specific procedures that must be followed. The NRC must specify the issue, the alleged violation of regulations (not generic communications), and the potentially hazardous condition in which your action or inaction would place the plant.

The NRC must provide you with an opportunity for a hearing before a disinterested tribunal. That gives you a certain amount of authority over the process and the ability to exercise your responsibilities in full compliance with laws and regulations. You should not look on this process as one that suggests you have done wrong.

In my view, it is very important that everyone recognizes his or her responsibilities. The responsibilities of the NRC and the licensees are very, very different. We need to focus in this area to evaluate our operations and cost burdens and ensure that we are doing the smart, right thing.

This effort is an important aspect of the current industry-wide initiative to evaluate how industry conducts its business and satisfies its responsibilities, and to ensure that these things are done as effectively and cost effectively as possible, consistent with industry's responsibilities under the license and the law.

7.4 Michael Wilson
Northeast Utilities

You have been given an industry perspective regarding 50.54(f), and later you will receive an issue-specific perspective on 50.54(f). I just want to drive home some points. I have chosen a quiz to drive home those points.

Question #1

For each of the following statements, indicate whether it is true or false regarding the provisions of 10CFR50.54(f):

a. The scope of action required by a licensee in response to requests is limited to submitting written statements signed under oath or affirmation.

b. Unless the information request is made to verify licensee compliance with the CLB of that facility, justification for the request must be approved in advance by the EDO or designee.

c. All information required to be submitted to the NRC Staff is requested pursuant to 10CFR50.54(f), or is explicitly identified in another provision of 10 CFR.

Michael Wilson—slide 1

There are three statements on the first slide, and I ask you to indicate whether each of them is true or false regarding the requirements of 50.54(f).

a. The scope of action required by a licensee in response to requests is limited to submitting written statements signed under oath or affirmation. Based on previous examples, one would think that's false, but if you actually read the rule, you will find that's all that it requires—written statements signed under oath or affirmation.

b. Unless the information request is made to verify licensee compliance with a CLB, then Jim Taylor or his designee has to approve the justification for that request. That's also true, according to the rule.

I didn't put this up here because I know of any abuses of that provision of the rule. In fact, that provision gives me some comfort. It indicates to me that members of the NRC staff at the highest level are involved in the decision-making process regarding the burdens that are going to be imposed on the industry. I put it up here because, if you combine A and B, you have 50.54(f)—its essence. If you just read the words, how could anyone complain? It's straightforward—written statements, properly justified, properly approved. It's only in the implementation of the rule that the questions and the criticism arise.

Yesterday it was mentioned that sometimes rule changes are not necessarily in order. It's just the implementation of the rule by the staff that may need modification.

c. All information required to be submitted to the NRC staff is requested pursuant to 50.54(f) or explicitly identified in another provision of 10 CFR. You might think that's true. Unfortunately, it's not.

There are other significant information requests that are made by the NRC staff that impose significant burdens on the industry. One that comes to mind is the requirement that each licensee have a requalification exam bank that includes 700 open reference exam questions, the majority of which must be multiple choice; approximately 30 simulator scenarios; and 100 job performance measures (JPMs). If you don't think the development of those materials is a burden, ask your training staff. I am certain they will attest that it is a burden.

Those examination materials are not the only things requested to support examinations. Our most recent experiences with providing required information to the NRC for requalification exams included 15 three-inch binders of materials sent to two different locations in the nation. Initial examinations are more burdensome; a recent experience involved 40 binders of various sizes, weighing 182 pounds total, sent to two different locations in the nation.

The requirements associated with examination materials are spelled out in NUREG 1021, which states, "Failure to provide complete, properly bound, and indexed reference material may prompt the NRC to return the material to the person at the highest level of corporate management responsible for plant operations and cancel the examinations." That is an information request made pursuant to a NUREG.

Question #2

As currently implemented, one could be led to believe that an underlying purpose of requests for information made pursuant to 10CFR50.54(f) is to :

a) Require that each licensee perform a systematic evaluation of their plant, estimated by the NRC Staff to require 10 man years of effort.

b) Require the development and implementation of $6 million MOV programs.

c) Require the installation of hardened wetwell vents for BWR Mark I containments.

d) Enable the Commission to determine whether or not the license should be modified, suspended, or revoked.

Michael Wilson—slide 2

Question 2 [multiple choice question] deals with the implementation of 50.54(f). One could be led to believe that the underlying purpose of requests made pursuant to 50.54(f) include:

a. Require that each licensee perform a systematic evaluation of their plant, which the NRC staff has estimated at 10 person-years of effort.

If you read the language of 50.54(f), the letters IPE and IPEEE are not there. Yet, if you read Generic Letter 88-20, it states, "Therefore, consistent with the stated position of the Commission and pursuant to 10CFR 50.54(f), you are requested to perform an individual plant examination of your plants." Those are the written statements that I alluded to earlier.

b. Require the development and implementation of $6 million MOV programs.

The dollar amount is certainly unit-specific, but it is a lot of money.

c. Require the installation of hardened wetwell vents for BWR Mark I containments.

I read the generic letter that requested that hardened wetwell vents be installed, and I was surprised: The request wasn't made pursuant to 50.54(f). Actually, the staff stated that the hardened wet well vents would be requested and that, if needed, a plant-specific backfit analysis pursuant to 50.109 will be performed. I bring this example up because it shows a proper way to impose new or revised requirements on the industry, or at least it is a method allowed via the rule, 50.109.

d. Enable the Commission to determine whether or not the license should be modified, suspended, or revoked.

This is the purpose as stated in 50.54(f), to provide the Commission with written statements to make such a determination.

I'd like to again read from a pertinent part of Generic Letter 88-20. It states, "The Commission concluded that existing plants pose no undue risk to the public health and safety, and there is no present basis for immediate action on generic rulemaking or other regulatory requirements for these plants."

If the Commission concluded there was no basis for other regulatory requirements for these plants, we might also conclude there would be no reason to modify, suspend, or revoke their licenses. Yet, this is the rule chosen by the staff to require IPEs and IPEEEs. I offer that the staff may have chosen the wrong rule, and with that comes a bit of concern for some.

Keep in mind that the entire IPE requirement and review process has been conducted outside any scrutiny by the public, yet it is being proposed as a tool to use in making decisions important to safety. Had IPE and IPEEE been imposed on the industry via rulemaking, the public certainly would have had the opportunity to be involved in that process. The choice of 50.54(f) as the means to implement IPE and IPEEE in effect excluded the public from such involvement.

What should be done? The question presented here offers a suggestion. Revision to 10CFR 50.54(f) is needed because (1) the language itself does not prevent its use for imposing new or revised NRC staff requirements, and (2) the justification of requests for information made pursuant to 50.54(f) can be inaccurate and subjective.

Question #3

Revision to 10CFR50.54(f) is needed because:

a) The language of the rule does not prevent its (mis) use to impose new or revised NRC Staff requirements.

b) The justification of requests for information made pursuant to 10CFR50.54(f) can be inaccurate and subjective.

c) NRC Staff restraint to limit "information requests" to only those which are in keeping with the underlying purpose of the rule cannot be assured without rulemaking.

d) All of the above.

Michael Wilson—slide 3

Slide 4 provides an industry cost estimate—in both person-years and, where available, dollars—for eight different plants to implement the IPE portion of Generic Letter 88-20. The estimates are in the neighborhood of 10 person-years. The NRC staff's estimates are also provided: 4 person-years, and a considerably different dollar amount.

Projected IPE Resource Requirements

Utility	Man Years	Cost
A	9	$2M
B	10	$1.5M
C	10	$2M
D	9	—
E	10	—
F	13	—
G	9	—
H	13	$900K
NRC ESTIMATE	4	$500K

Michael Wilson—slide 4

The point I want to make is this: If the justification to request information pursuant to 50.54(f) places the burden, in part, on the industry, we should be able to expect that the estimate of that burden be reasonably accurate. In this case, I think it is not.

I do not want you to think that Northeast Utilities does not like IPE or IPEEE. We are clearly supporters of PRA. If Generic Letter 88-20 had not been issued, we would have gone forward on our own schedule and developed our PRAs—effectively doing the same thing required by IPE and IPEEE, except for preparing the report and submitting it to the staff.

Without rulemaking, we cannot be assured that the NRC staff will limit its information requests to those that are in keeping with the underlying purpose of the rule. The examples that have been given are fairly recent. We're talking about generic letters circa 1988-89.

On Slide 3, (c) is probably true. Since (a), (b), and (c) are all true, the correct answer is (d), all of the above.

In communications training I had a number of years ago, someone told me that words don't have meanings; people give meanings to words. I think that might apply to the staff's implementation of 50.54(f)—the staff has given a meaning to 50.54(f) that is different from the words of the rule.

7.5 Herbert E. Kook
Entergy Operations, Inc.

Lessons Learned: Generic Letter 89-10 Information Request

Entergy Corporation is about a $15 billion or $20 billion corporation in the deep South. We own utilities in Arkansas, Mississippi, and Louisiana. By a number of measures, we're very successful right now. I say right now from the sense that our management has embraced a philosophy called total quality. Inherent in that philosophy is the concept that no matter how good you are today, you not only can be better tomorrow, but you must be to succeed. That's applicable, we think, to fossil power, nuclear power, and any endeavor you want to look at.

In total quality, we look at two aspects: processes and content.

For this presentation, the process is a generic letter, GL89-10. The content deals with motor perated valves (MOVs). Please bear in mind the total quality philosophy and those two aspects—process and content.

In this example, I want to tie the process in with the content. Frankly, there are good things and bad things for the industry and the NRC. Good and bad are probably poor terms. Total quality has taught us that you need to go back and look at what you did yesterday—not to assign blame, point fingers, and take entrenched positions, but rather to determine what you can do better tomorrow because of what you've learned from yesterday. That is the benefit I want to share with you on GL 89-10.

The main point I would like you to remember is hindsight: in 1993, I'm here talking about a 1989 generic letter. In that time, we've learned a lot. What we knew in 1989 was very different from what we know now. I'm not trying to go back and cast stones at anyone. We just want to take some lessons learned and offer them to others.

Major Lessons Learned

- MOV concerns should have been more effectively addressed by utilities earlier, resulting in:
  - Resources more effectively used
  - Total costs reduced
  - Overly prescriptive regulatory requirements avoided
  - Issues incorporated into existing programs and the "GL 89-10 Program" closed earlier
- Regulatory requirements and analyses may not recognize plant-specific differences which can significantly affect their conclusions; e.g., programs reaching a point of diminishing returns such as a 95% effective program achieving the same measurable results as a 99% effective program
- Using today's knowledge, a careful review of Generic Letter 89-10 and especially its regulatory analysis would have determined a more appropriate response, i.e., alternative actions which would have achieved the same results with a much better use of resources
- An Information Request citing 10CFR50.54(f) can impose significant new programs and requirements without following 10CFR50.109; the responses to these situations must be carefully considered

Herbert Kook—slide 1

On the first slide, we've tried to summarize the big picture regarding what we've learned about the MOV issue in regard to content and process.

In regard to content, we feel we should have been more proactive in addressing MOV concerns. In hindsight, we think we spent too much money putting this thing to bed, and we're not all the way to bed now. We assisted in driving prescriptive regulation to deal with this issue.

We are having trouble getting this separate "animal" called MOV into the everyday programs we need to live with for the remainder of plant life. If we had done better earlier, we would be a lot further along and would have improved in those areas. We're taking that to heart, and I hope all of you do as well. However, keep in mind that I'm saying in April 1993 what we could have done in 1989. During the rest of 1993 and in 1994, we're going to try and apply those lessons to other issues.

Something else we found is that when the NRC deals with a generic communication or a requirement, they have to address more than 100 units. We've got four units. When we address generic issues like this, we need to do it for each unit. We need to take that into account and look at the concern itself and the best way to resolve the concern for each unit.

This is what we have tried to address in discussing prescriptive regulation: If you solve a problem very specifically for a great number of units, you have not optimized the solution for any given unit. This is something we as an industry—with one regulator and a number of utilities with multiple units—are going to have to live with. The best way to live with it is by preventing regulations from getting to the point of prescription.

In our MOV program, we found that we could have achieved the same results with a narrower scope and less money. We did what was required, and will continue to do so, but in hindsight, we could have achieved the same benefit with less effort.

That is the content portion of Generic Letter 89-10.

In terms of process, information requests really should not impose new programs. The key to that is involving the public, the utilities, and other groups early in the process. The

NRC has made significant changes recently, for example, putting all generic communications in the Federal Register for review and getting the CRGR involved. Those are very positive steps.

Regulatory Analysis Assumptions versus Actuals

- NUREG/CR 5140 Assumption:

  "Extension of these requirements form Bulletin 85-03 systems to other safety-related systems will just use the same techniques, procedures, and equipment, and will not require any new programs." [section 5.1.7(3)]

- Actual:

  GL 89-10 has required extensive, new programmatic efforts regarding MOV design, operation, and maintenance, and the application of this knowledge to all safety-related MOVs.

- NUREG/CR 5140 Assumption:

  A similar reduction in Core Damage Frequency (CDF) would result from including each safety-related MOV as was achieved from including the most important MOVs.

- Actual:

  Of the 258 MOVs covered by GL 89-10, only 74 appear in the Level 1 PRA; i.e., actions taken on 184 MOVs (71.3%) have no impact on CDF. (Six MOVs contribute 99% of the CDF, with these six and 23 others contributing 99.99%)

Herbert Kook—slide 2

NUREG/CR-5140 stated the assumption that "extension of these requirements . . . will not require any new programs." In our minds, these were bona fide requirements imposed on us via an information request. In hindsight, we see that we really have had to do a lot of new things. They were not unnecessary, but they were new and different.

The NUREG/CR also reflects a belief that safety benefits (reduction in core damage frequency) would be significant. Now we have the IPE available and can see that they were not in many cases. We caution people about relying on these specific numbers.

Approximately 74 MOVs are the real contributors to the potential core damage frequency. We believe if we had done a bang-up job on those 74 MOVs, taken the lessons learned from them, and applied those lessons (possibly less rigorously, depending on our findings) to the other MOVs, we could have saved a lot of resources that we could have used better elsewhere.

We went through a lot of soul searching about whether to present these slides. We're not ashamed of the numbers; we feel they're good numbers. However, if we start debating this number versus that number and this category versus that category, we're going to lose sight of what we want to say today, which is that we needed to do some things on MOVs. We could have done those things earlier, and hindsight tells us we could have done them smarter. The point here is to offer the advice that cost-benefit analyses could be improved. We probably would have underestimated these in 1989. We've met the requirements for MOVs, we're glad we did, and we've learned some things.

Conclusion

- Technical issues should be resolved in an effective and timely manner
- Regulatory requirement and their bases should be carefully considered to determine appropriate responses
- Appropriate responses are those which have been properly considered: realistic plant-specific benefits and costs (including diminishing returns), possible alternative actions to achieve clearly defined and necessary results, and issue closure
- To ensure effective regulation, new regulatory requirements and positions should be in accordance with 10CFR50.109 rather than by Information Requests under 10CFR50.54(f)

Herbert Kook—slide 3

Technical issues should be resolved in an effective and timely manner. This is a good philosophy, but it is sometimes difficult to implement. So many things come up in a given day, and sometimes it's difficult to tell which issues are really important and which ones are not. That's where the IPE will be a helpful guide to help you get your bearings in the forest.

Our company has an informal philosophy: Do the right thing. Don't get too concerned about whether it's an information notice or a bulletin or a NUREG or a rule; you need to do the right thing. You need to judge the issue to the best of your ability on safety consequences, necessity, and economic benefit, and then do what you need to do. The regulatory requirements and their bases should be carefully considered to determine appropriate responses.

The staff and industry are reaching a new awareness that trying to address an issue with one communication or one rule for all utilities may not be appropriate. We want to do the right thing, but we don't want to do the right thing for $10 million if we can get the same result for $1 million. We want to meet requirements in the most appropriate manner.

One thing the industry often overlooks is issue closure. When an issue is first raised, it is difficult to tell how to bring it to closure. You may be able to close it quickly with a minor modification, or it may take a research effort. You want to do the right thing, but you need to think about alternatives that the NRC staff can accept and that will show you reached your goal.

There will be occasions for new regulations, and there will be occasions when new generic communications are appropriate. We feel that the best way to get input and handle new requirements will be to use 10CFR50.109 and rulemaking, as opposed to the information request.

7.6 Open Forum Discussion Summary

John Sutton
Yankee Atomic Energy Company:

Deficiencies in NRC cost-benefit analyses under 10CFR50.54(f) include:

1. Many cost-benefit analyses lack rigor and documentation. We cannot reproduce the numbers determined by NRC based on information provided.

2. Many generic letter supplements only reference the original cost-benefit analysis. There should be a differential cost-benefit analysis, as a minimum, to assess the effect of the supplement.

3. The NRC staff should be more sensitive to the effect on prudency hearings when staff analysis of costs is not realistic.

4. There are no criteria for deciding when a problem is generic. Some requirements are too broadly applied.

5. Information to support a generic requirement should include the inspection module and implications.

6. The staff should more rigorously distinguish between information requirements under 50.54(f) and new requirements under 50.109.

It was a mistake to remove the CRGR from the Executive Director for Operations (EDO), as the move lessens the importance of the CRGR. CRGR staff should have more resources to perform its work.

Roger Reedy
Reedy Associates:

Millions of dollars were spent on implementing Generic Letters 79-02, 79-14, and 88-05 with negligible increase in safety. Generic Letters 90-05 and 93-21 improperly interpret the ASME Code and nothing has been done to correct the error.

Herschel Specter
NYPA:

Licensees should identify the specific cost-effective design modifications to be taken to address the issues raised by the NRC staff. The staff should avoid unnecessarily drawing conclusions concerning the appropriate way to resolve the problem and leave room for licensee proposals.

8. Requirements for Combustible Gas Control Systems

8.1 Rich Barrett
Nuclear Regulatory Commission

We're very interested in hearing from industry representatives today about the specific areas where you believe reductions can be made in the hydrogen rules contained in 10CFR50.44 and 50.34 , what you think the risks associated with these reductions may be, and also what resource savings you believe can be gained from these reductions.

We're equally interested in hearing from members of the public and interested organizations who have concerns about these potential reductions. We'd like to relay your comments and your questions on these issues to the panelists.

I will now briefly summarize the requirements of 50.44 and 50.34 and the proposed relaxation's of them, which we published in the Federal Register in January 1993.

10CFR50.44 presently requires the following:

- Mark I and Mark II containments are required to be inerted for the purpose of hydrogen control.
- BWR Mark III and PWR ice-condenser containments are required to have control systems to deal with 75-percent metal-water reaction hydrogen. Large, dry containments are exempt from this requirement, but not from the requirements for recombiners.

10CFR50.34 presently requires the following:

- All future reactors must to be able to deal with 100-percent, metal-water reaction and keep the concentrations below 10 percent in the containment.

The Federal Register Notice of Proposed Rulemaking proposed the following relaxation's:

- Eliminate from the rule the specific amounts of hydrogen that must be dealt with;
- Establish that recombiners can be eliminated from large, dry, and related sub-atmospheric containments; and
- Capture, in broad terms, some of the prescriptive aspects of the current rule and recast them in the form of a regulatory guide. The intent is to go toward a more performance-based rule while reformulating some of the old prescriptions as guidance.

8.2 Kurt Cozens
NUMARC

The topic of this workshop is basically elimination of requirements marginal to safety, and there's really two aspects that we've looked at in this particular session, and that is housekeeping, some of those things that maybe we've done and they're a good idea at first, but due to the evolvement of the activities in the industry and the understanding of the technology, may not have the same merit or there may have been something else done that superseded that requirement that we just haven't quite cleaned up.

Also, we've talked a lot about performance-based regulations during this workshop. I kind of pondered if a better name for the workshop would have been alternate regulatory requirements to maintain the level of safety that we presently have.

We looked at the Federal Register and the proposals for changes and the proposals for what I call housekeeping that were present in there, and talking with members of the industry, utilities, we believe that what has been proposed in the Federal Register probably is worthwhile, it makes sense, and that it's something we ought to do.

There's housekeeping that will affect the operating power plants, and these things would be beneficial to make certain that the current regulations actually match up with what has been proposed, what is being done in industry, and that exemptions that have been granted, basically generically granted, would indeed be worthwhile to codify on a generic basis.

We also see that this activity, which could be split into two parts for operating plants and for future ALWR plants, are compatible.

The operating power plants basically have some housekeeping activities that could be done that would be beneficial. We will remove inherent regulatory burdens without reducing the safety.

In the same vein, where there's actions to remove recombiners, it's not clear that a plant would choose to do that. The plant which has them installed may not have a regulatory need for them, but the burden of removing them would be a choice that they could make on a plant-specific basis, and at that point, they can choose to do that if it makes economic sense for their particular situation.

For future plants—those are plants which are—the regulatory basis is being established right now—we do not foresee that the Federal Register proposals would have a monumental change to what is going on currently, but there is the inherent advantage that what has been proposed could lead to an improved method for doing the hydrogen controls, and so, we would like to have that option through the performance-based regulatory process which has been suggested.

Therefore, in short, after reviewing what the Federal Register has suggested, after discussing that with members of the utility industry, we feel that what is proposed will be useful and beneficial.

We think this would be a good case for testing the process of making these changes. We have a lot of agreement already on what can be done.

So, in developing the process for how do we make changes to the regulations that will minimize any impact to safety and maintain our margins of safety with minimal impact, I think that this would be a good case to exercise the process, so when we do run into a situation that's a little more challenging, we will have established some basis on which to do that.

In the process of discussing with industry whether or not these proposed changes look beneficial, I realized that there may be some other elements of this area that should be addressed, and these basically fall into the area of what I call housekeeping again.

Industry Comments

- Proposed revisions for 10CFR50.44 and 50.34(f)
  - Worthwhile
  - Straight forward
  - Candidate for prompt actions
  - Flexibility for some utilities
    - removes inherent regulatory burden without reduction in safety
    - utility may elect to leave recombiners in place
  - Minimal effect on ALWR design certifications currently under review

Kurt Cozens, et al.—slide 1

There isn't an inherent reduction in safety posed but a recognition that time has gone on and there are some activities associated that are parallel to this particular topic that we ought to address.

Resolution of inconsistency between Standard Technical Specifications (STS) and current regulations

10CFR50.44, 50.46, & Appendix K

Zircalloy or Zirlo

STS 5.3.1 (NUREG 143X)

Zirconium alloy fuel rods

- Recommendation
  - Reflect consistent terminology regarding zirconium alloy based fuel rods
- Justification
  - Consistent with recently issued STS
- Benefit
  - Consistency; allow licensees to adopt STS wording

Kurt Cozens, et al.—slide 2

The industry has put a lot of effort into working with the NRC staff on standardized tech specs. We have identified one inconsistency with regard to the cladding material. The current regulations permit zircalloy and zirlo as materials that are appropriate for this cladding material.

In the standardized tech specs, we have identified a zirconium alloy fuel rod material as appropriate. This comes with certain

controls that require staff to approve the material you're using, but it is a generic set of words that is present in the standardized tech specs.

This is an inconsistency because of a recent example. When one utility attempted to implement the standardized tech specs, it was identified that you can't do that, because the regulations currently are limited to zircalloy and zirlo, not necessarily that the staff technically disagreed with it, but the letter of the regulation indicated something different.

Hence, we would recommend that, in the process of going back and examining the hydrogen control issues, that this would be a good time to clean up this inconsistency and make a determination of what the appropriate set of language should be, whether we should be restrictive on the alloys in the regulations or we should establish the process in the regulations that would permit a zirconium alloy cladding material with appropriate checks by the NRC.

This would bring us consistency and would allow licensees to then adopt what has been proposed in the standardized tech specs.

Regulatory Guide 1.97, "Post Accident Monitoring Equipment"

- Current requirement
  - Hydrogen monitoring equipment in standby mode
- Recommendation
  - Instruments warehoused and available for *installation/calibration if needed*
- Justification
  - Slow hydrogen buildup; sufficient time exists to install monitors
- Benefit
  - Reduced maintenance/surveillance demands

Kurt Cozens, et al.—slide 3

Our next area of concern has to do with hydrogen-monitoring equipment. Currently, we're required to have this equipment in a standby mode. It's unclear to us that this is really a necessity to have it in standby or if it is merely justifiable having that equipment readily available for installation when it is needed.

We feel that the possibility of changing this to having the equipment not in standby but warehoused, readily available for use, is justifiable based upon the slow rate of hydrogen generation.

We believe that there is sufficient time to install the equipment should it be needed, and this would have the benefit of reducing cost of having the equipment on standby and monitoring, also the ALARA exposures and several other standard maintenance type of issues when you have to deal with equipment and you have to calibrate it in place.

8.3 Joe Burton
Gulf States Utilities

I'm Joe Burton. I am the Probabilistic Risk Assessment Supervisor of River Bend Station, and also, for the last several years, as part of the severe accident work at River Bend, I have been a member of the BWR 6 Mark III Containment Hydrogen Control Owners Group, which is made up of the four domestic BWR 6s with Mark III containments, and the purview of that committee is to look at the implementation of 10CFR50.44 at the Mark IIIs.

As part of that effort, the HCOG, as we call it, has been in existence for almost 10 years, and they have spent somewhere on the order of $5 million to $10 million on detailed experimental work regarding hydrogen burn phenomena in Mark III containments. So, we have definitive information on hydrogen behavior in large, de-inerted containments.

The things I would like to talk to are the requirements for Mark IIIs and for ice-condenser containments, and I've got ice condensers on the slides—I am not really an expert on those. I do know Mark IIIs, and that's really what I will be speaking to.

Now, under the existing regulations, we have Reg Guide 1.7, which requires that we mitigate the hydrogen generation from a 5-percent metal-water reaction. Reg Guide 1.7 postulates a design basis LOCA and the hydrogen generation from such an event.

Mark III and Ice-Condenser Containments

- Evolving bases for hydrogen mitigation
  - RG 1.7: 5% metal-water reaction
  - 10CFR50.44: 75% metal-water reaction
- Recommendations:

  Mark III Containments:
  - Remove TS requirements or increase allowed outage times for hydrogen purge, mixing, and recombiner systems

  Ice-Condenser Containments:
  - Remove TS requirements or increase allowed outage times on hydrogen purge, skimmer, and recombiner systems
- Justification
  - Hydrogen igniters bound function provided by hydrogen purge, mixing, skimmer, and recombiner systems
- Benefit
  - Removes inappropriate limiting conditions for operation

Joe Burton, et al.—slide 1

The systems that we have in a Mark III to mitigate that are hydrogen mixing, which connects basically the atmospheres of the dry well and the containment and allows you to bring hydrogen out of the dry well to the containment atmosphere, so that the hydrogen recombiners in containment can deal with that hydrogen build-up.

The other system that we have for the 5-percent metal-water reaction is the hydrogen purge system, which is a long-term system to use, you know, 14-day, 30-day post-LOCA-type situations.

We also, under the hydrogen control rule, have to have a system that will mitigate a 75-percent metal-water reaction, and those are the hydrogen igniters which we have in containment. That's a distributed system throughout containment to prevent hydrogen pocketing in various sub-compartments in areas of the containment.

The hydrogen igniters, for those of you not familiar with them, are basically glow-plugs that—I guess we use General Motors glow-plugs like out of a diesel —that are distributed throughout the containment in areas where you could expect to have hydrogen pocketing, say the dome of the containment, whatever, and those—they are distributed.

There are redundant power supplies in that we have two different trains fed off the A and B emergency diesel systems, and those are there to handle hydrogen build-ups that you would expect from a 75-percent metal-water reaction.

What we're recommending is that we remove from our technical specifications the requirements for hydrogen purge, hydrogen mixing, and hydrogen recombiners in a Mark III containment, or as a minimum, we increase the allowed outage times for those particular systems, as are found in tech specs now.

The rationale for that is, as I've said, the hydrogen control rule system of hydrogen igniters will mitigate a much more severe event than any of the Reg Guide 1.7 systems can mitigate.

So, we have put in—we're trying to take the benefit of being a lot smarter than we were when Reg Guide 1.7 came out. We have done the additional modifications that the ensuing regulations required, and those more than bound the conditions that we originally had to put in the first three systems that I mentioned of mixing, recombiners, and hydrogen purge. So, we feel like that's warranted.

In this case—I heard some discussion yesterday about not throwing out design basis arguments by focusing on severe accident. Well, in this case, we've got design basis systems which cannot in any way, shape, form, or fashion mitigate a severe accident, but we have a severe accident system which can more than handle the design basis considerations.

So, we feel like it's warranted to just rely on the severe accident system, being the hydrogen igniters, and that concludes my remarks.

8.4 Open Forum Discussion Summary

Charles Turk
Entergy Operations:

What new information provides the basis for the position that recombiners can be eliminated from sub atmospheric and large, dry PWR containments?

Moni Dey
NRC:

Studies of the hydrogen control issue documented in NUREG/CR-4330, entitled "Review of Light Water Reactor Regulatory Requirements," showed, using risk assessment techniques, that the risk significant scenarios were those in which the recombiners did not help very much.

Dave Modeen
NUMARC:

The containment performance improvement program indicated that, even assuming 75-percent zirconium-water reactions and the types of concentrations you would then get in a large volume, a burn would not challenge the ultimate pressure values of the containments. This indicated that the recombiners could be removed, without replacement with some other type of mitigating system.

9. Quality Assurance Requirements

9.1 Ernie Rossi
Nuclear Regulatory Commission

The purpose of this session is to obtain input from the panelists and audience on proposed modifications to the NRC's requirements and practices in the area of quality assurance. We are also interested in supporting justification and bases for any proposed modifications that people may have.

Particular issues for consideration include the nature and extent of the regulatory burden, including the cost impact of the NRC's quality assurance requirements and practices, and arguments that any specific requirement or practice is marginal to safety.

We would like participants' input on the definition and use of performance-based quality assurance requirements, the risk significance of quality assurance requirements, and actual Appendix B requirements versus the NRC staff's interpretation of the requirements.

The panel session has been organized in the following sequence. Each panelist will make a 10-minute presentation from the podium, using overhead slides if they wish. Members of the audience who had previously indicated their intention to speak will provide their remarks, taking no more than 10 minutes. We have only one member of the audience who has asked to make formal remarks at this session.

After the formal presentations have been made, the session will be open for other members of the audience to provide remarks, ask questions, and participate in discussions with the panelists or other members of the audience. I ask that anyone speaking provide his or her name and organization/affiliation very clearly, so that our transcriber can take that down.

I would like to emphasize that the purpose of this workshop is not for the NRC to present positions, defend positions, or answer questions. The purpose is to receive input from industry and any members of the public in attendance.

Appendix B to 10CFR Part 50 establishes quality assurance requirements for the design, construction, and operation of structures, systems, and components that prevent or mitigate the consequences of postulated accidents that could cause undue risk to the health and safety of the public. There are a number of perceived problems with NRC quality assurance requirements and with our practices in implementing them. I will mention several of the more important ones for you to think about during this session.

1. As implemented, quality assurance programs may emphasize documentation over performance.

2. Responsibility for quality is often perceived to lie in the quality assurance organization rather than the line organization.

3. The list of items to which quality assurance requirements are applied is far larger than was originally contemplated.

Having stated these possible problems with the NRC's approach to quality assurance—and I'm sure there are many other problems that may come up during this session—we will now ask our panelists to make their presentations.

9.2 Lynne Goodman
Detroit Edison

Improving Effectiveness of Performance-Based Audit Programs by Reducing the Regulatory Burden

I'm going to be talking about how to improve—not reduce, but improve—the effectiveness of performance-based audit programs by eliminating some of the regulatory burden. I'm going to be talking about the audit program. An audit is a look at how the organization is performing its activities, how those activities are being accomplished, and comparing them to established requirements and also to our management expectations.

Audit

A formal independent examination with intent to verify conformance with established requirements. (ANSI N18.7)

Lynn Goodman - slide 1

We have a performance-based audit program. That means we watch people's performance at work as opposed to just looking at paper.

I'd like to tell you about an audit of our emergency planning organization that we performed in February. We spent 220 hours auditing our emergency preparedness. We determined we did quite well. We did a lousy audit.

We did our audit in February of this year because the regulations require that we audit every 12 months. We could not wait until March, when we had a scheduled drill, because then we would have been out of compliance with the regulations. So we did an audit, we got results, we met every regulatory requirement there was. But as I said, we did a lousy audit.

Requirements for Performance of Audits

- Technical Specifications Section 6
- Environmental Protection Plan
- 10CFR50 Appendix B
- 10CFR73.56 (g) (1) - Access Authorization
- 10CFR50.54 (t) - Emergency Preparedness
- 10CFR71.137 - Environmental Protection - Radioactive Materials
- 10CFR26 - Fitness for Duty
- 10CFR26.80 - Fitness for Duty Testing Lab
- 10CFR20.1101 - Radiological Protection
- 10CFR50.54 (p) - Safeguards Contingency Plan
- 10CFR72.40 (d) - Safeguards Contingency Plan

Lynn Goodman - slide 2

In March, we did a surveillance during the scheduled drill. That's the type of thing I want to talk about—how we can make our audit program more effective so that we're actually looking at things at the time it makes sense to look at them.

There are a number of requirements for audit programs. I am going to go over just a couple of them. One of the key ones is Section 6 of our tech specs. We have an environmental protection plan, Appendix B, and a number of other requirements for audit.

Requirements for Performance Audits (continued)

- 10CFR73.55 (g) (4) - Security Program
- NUREG CR-4640 - Simulator
- Reg Guide 1.155 - Station Blackout
- Reg Guide 1.21 - Environmental Protection - Radioactive Effluents
- Reg Guide 4.1 - Environmental Protection - Environmental Monitoring
- Reg Guide 1.33
- Reg Guide 1.144
- ANSI N18.7
- ANSI/ASME N45.2.12
- QA program as contained in updated Final Safety Analysis Report or QA Topical Report

Lynn Goodman - slide 3

The list goes on and on, including regulatory guides and NUREGs. There are a number of places that have audit requirements. Some have frequency requirements, some have just topic requirements.

Our other governing document is our QA program. For us, that's in our Updated Final Safety Analysis Report. For some plants, it's in a topical report.

The frequency of audits ranges from 6 months to 36 months, depending on the audit topic. With very few exceptions, there is no flexibility permitted for schedule extension. That leads to resource waste, as I mentioned with our emergency planning audit; we got very little benefit from that audit other than meeting our technical specification regulatory requirement.

Frequency of Audits per Requirements and Guidance
6 months - 36 months

With few exceptions, no flexibility permitted for schedule extension. Leads to resource waste with no benefit.

- Perform audits when due regardless of activities in progress
  - Can lead to meaningless audits
  - Can lead to extra audits, e.g., to avoid refueling or to catch refueling
  - Can lead to auditing prior to corrective action completion when waiting a short time could have scheduled audit to measure effectiveness of corrective action
- Can claim resources for non-problem areas that would be better used in monitoring and assessing weak areas

Lynn Goodman - slide 4

We have to perform audits—regardless of what activities are in progress—based on when the audits are due. So we can have a meaningless audit by looking at an activity when there is no work in progress.

We can perform extra audits. For examole, if we want to take a look at in-service inspection, it makes sense to do that during a refueling outage, when we are actually doing in-service inspection. However, if the audit is due when we're not in a refueling outage, we might have to do an extra audit. That means we are double auditing.

On the other hand, we might want to avoid a refueling outage. It doesn't make a lot of sense to do an emergency planning audit during a refueling outage; it makes a lot more sense to use our resources to look at the work we're doing during the refueling outage.

The frequency requirement also can lead to audits being performed before expected corrective action is complete. For example, we have an audit that's not required by regulation scheduled for June of this year. Corrective action is going to be done in June. Therefore, it makes more sense to audit in August to see how effective the corrective action is. That's what we are going to do. If that were an audit required by technical specifications or a regulatory audit, we would not have that flexibility, and we would be auditing at a time when we know our program is not yet corrected.

The frequency requirement can take resources from non-problem areas. If you have a problem developing, it would make a lot more sense to look at the problem area. For example, if we have a weakness in our maintenance organization that we'd like to explore, we have to balance the need to look at the maintenance organization with any required audit and determine where to put our resources—toward the required audit, so we can do a good audit, or toward an audit of the problem area. Currently, we usually have to choose to do our required audit, and maybe put limited resources in the problem area. I think our problem areas should get more attention—more audits and surveillance's. That is what an effective performance-based audit program would do.

My proposal is that the licensees control the audit program, with NRC providing oversight instead of control. The Great Lakes QA Managers also support this proposal.

Proposal

Licensees control audit program with NRC oversight instead of NRC control

Lynn Goodman - slide 5

This proposal would involve several actions. It would require technical specification changes, regulation changes, regulatory guidance changes, and QA program changes.

Actions

- Tech Spec Changes
- Regulation Changes
- Regulatory Guidance Changes
- QA Program Changes

Lynn Goodman - slide 6

We're looking at three options. We prefer the first one, but we are willing to pursue any option that would be easier to license, and anything the NRC would be interested in approving.

Tech Spec Changes

- Three options (Option 1 preferable)
- Want to pursue option with greatest chance of timely success

Lynn Goodman - slide 7

Option one is to remove the audits from Section 6 of the Technical Specifications. We would have the audits listed in the QA program. The frequency of core audits, such as maintenance, engineering, operations, rad protection, design change, and so forth, would also be listed in the QA program.

Tech Spec Changes (continued)

Option 1 - Remove Audits from Section 6

- Audits list in QA Program
- Frequency of core audits list in QA Program, e.g. Operations, Maintenance, Radiation Protection, Design Change, Corrective Action
- Changes in Audit Coverage specified in QA Program treated per 10CFR50.54 (a)
  - Reduction in audit coverage requires NRC review
- Audits required by rules conducted at specified frequency (unless rule changes or exemption granted)
- Provides more control to QA Management on audit and other oversight activities
- Permits greater flexibility based on performance and plant activities
- Allows licensees to better focus QA efforts on how to improve weak or poor performance areas
- Consistent with draft Standard Review Plan 17.3

Lynn Goodman - slide 8

Changes in audit coverage would be handled like any other change in our QA program: It would be reviewed to determine whether it reduces the commitments in the audit program and whether it still meets Appendix B. NRC approval would still be needed for any changes that resulted in a reduction in commitments. We would conduct audits required by rules at the frequency required by the rules, at least until we had a rule change or an exemption. There are a lot of frequency requirements in some of the rules.

What this would do is provide more control to QA management on audit and other oversight activities—such as surveillances, special examinations, or inspections—in terms of applying the resources toward the activity where we feel we have the problems and where we could really get more bang for the buck. It would provide greater flexibility based on the plant performance and plant activities, and allow us to better improve our weak areas. This is also consistent with draft Standard Review Plan 17.3.

Tech Spec Changes (continued)

Option 2 - Tech Specs retain requirement to audit QA organization activities under Offsite Review Committee cognizance (otherwise same as option 1)

- Assures Offsite Review Committee retains oversight of QA activities and this is not changeable by QA program change

Lynn Goodman - slide 9

The second option is very similar to the first, except we would leave one audit in the technical specifications—the audit that audits the QA organization. That would mean the Offsite Review Committee would continue to have control over that audit.

Tech Spec Changes (continued)

Option 3 - Remove audit frequencies only from Tech Specs

- Audited areas not affected
- Provides some flexibility to adjust frequency based on performance and plant activities
- Consistent with approach in revised Standard Tech Specs to remove audit frequencies

Lynn Goodman - slide 10

The third option is to remove only the audit frequencies from the technical specifications, but leave the audits in. This would give us a little flexibility to change the frequency of our schedule, but it would not really give us as much flexibility as we would like. This is

consistent with the new standard technical specifications.

Regulation and Regulatory Guidance Changes

- Currently requirements for audits are contained in multiple locations
- Consolidate into one requirement for Audit Program
- Revise Regulatory Guides
- Control over Audit Program in QA Program

Lynn Goodman - slide 11

Currently, audit requirements are contained in multiple locations. We think they should be contained in one location in the regulation. We should also look at the regulatory guides and determine whether we could revise and consolidate them, and put control of the audits in the QA program.

QA Program Changes

- QA Program revised to include listing of audited areas and frequencies of core audits
- QA Program change implementing this major revision to receive NRC review in parallel with Tech Spec change review

Lynn Goodman - slide 12

The QA program would be revised to include a listing of the audited activities and frequencies, and that first QA program change would be reviewed at the same time the technical specification change would be reviewed.

Licensee Actions

- Meet with NRR to discuss Tech Spec change options
- Submit first Tech Spec change and QA Program change
- Other licensees submit Tech Spec changes
- Submit further QA Program changes as appropriate following rule changes and Regulatory Guide changes

Lynn Goodman - slide 13

Actions that we would need to take as licensees include meeting with NRR to discuss the technical specification change options, submitting the first technical specification change and QA program change, and following up with the rest of us submitting technical specification changes. We would then submit additional technical specification changes as the rules or regulatory guidance allowed us to change.

NRC Actions

- Meet with licensee on Tech Spec changes
- Review and approve submitted Tech Spec and QA Program changes
- Perform review of all rules and regulatory guidance on audits
- Propose rule consolidating rules into one. May be just revision to 10CFR Appendix B
- Propose changes to Regulatory Guides
- Approve revised rule
- Approve revised Regulatory Guides

Lynn Goodman - slide 14

We are asking the NRC to do the following:

1. Meet with us to discuss this QA program change and the technical specification change;
2. Review and approve our submittals;
3. Review the rules and regulations that cover the audit program; and
4. Determine the best rule change and regulatory guidance changes to better consolidate the requirements, making them more usable and more flexible so licensees could have better, more effective QA audit programs.

I'm talking about how to improve, not reduce, but how to improve the effectiveness of performance-based audit programs by eliminating some of the regulatory burden.

9.3 Alex Marion
NUMARC

Good afternoon. I am going to talk to you about a NUMARC effort in establishing a working group to take a look at our quality programs. Before I get into specifics of the purpose, objectives, and goals that are being proposed, let me make it very clear that this is not a regulatory bashing exercise.

In my discussions with a number of QA people in the industry, I've learned that everyone feels the Appendix B criteria are sound. The real problem is in the implementation of the criteria, from the standpoint of the regulatory process that carries that forward. More importantly, from the perspective of contribution to problems, the industry bears an extensive amount of responsibility for overreacting and overapplying those criteria in their own programs.

I am going to cover the mission statement that has been drafted for the working group. We have already staffed up the effort. There are 21 members, 15 of whom are from the utilities.

We are having our first meeting at the end of May. The first meeting will be to commiserate, exchange ideas, and develop a consensus on the mission statement, which will establish the purpose and goals of the working group. As a normal course of action, we at NUMARC take a cut at a "straw man" for such a mission statement.

The fundamental purposes are to evaluate current industry practices in implementing Appendix B quality programs and to identify areas for improvement without compromising quality objectives in nuclear plant design, construction, operation, modification, and decommissioning.

You need to focus on quality objectives. I need to make a point about industry's primary objective relative to improvements in the regulatory process. That objective is to sustain the level of safety and performance, and, through the exercise of improving regulations, demonstrate enhanced safety through proper allocation of resources. From the standpoint of quality objectives, there is nexus to that primary objective of sustaining the level of safety.

The working group will be responsible for coordinating industry activities relative to the development and implementation of any improvements in quality programs, and will provide unified industry interaction with NRC management.

A couple of the goals we have identified seem to indicate that we have lost sight of some fundamental principles. The question comes to mind, what is it that we are trying to achieve by our quality programs? If you consider what was discussed yesterday and this morning, especially in regard to the discussion on 50.54(f), there is a sense that we have a compliance culture. It's a compliance culture that is driven to satisfy the perceived expectations of the headquarters or regional NRC staff, i.e., to satisfy the expectations that the utilities think the NRC has, even though those expectations have not been directly communicated, and to satisfy interpretation of Appendix B criteria.

The things people think they need to do are overwhelming and become very complicated. We feel it is important to get back to some fundamental quality principles relative to what it is we are trying to achieve in this never-ending pursuit of quality. As I said earlier, we feel the Appendix B criteria are legitimate and appropriate. They make a lot of sense. They cover some fundamental concepts that need to be addressed.

As the working group moves forward, we are going to look at the ISO 9000 series of standards that are being developed in the international arena and are slowly coming into the U.S., basically from the standpoint of the manufacturers that sell products and services internationally. We are going to look at those standards and assess the advantages and disadvantages.

I understand ASME has developed a comparable assessment, if I'm characterizing that appropriately, of NQA relative to some of the ISO criteria. We will look at that.

We are also going to look at performance-based and risk-based approaches to quality programs. We will look at using those methodologies to identify what essentially is your Q list or your list of quality items. Those

of you who have a good sense of how expansive your list is can appreciate the benefit of such an effort.

The working group will also coordinate activities of other industry organizations (EEI, EPRI, and INPO) as well as standard development organizations already mentioned (ASME, NQA, ASQ, CI, IEEE, and the American Nuclear Society). Finally, we are going to interact with NRC management once we reach a consensus on what improvements may be appropriate.

After we announced that we were starting this effort, the following questions were put to me: What will be the output? Is NUMARC going to develop additional guidance? Is EPRI going to develop additional guidance? Is ASME going to issue another standard? It's too early to tell what, if anything, is going to come out of this effort. However, we feel that now there is an excellent opportunity to test the waters. There are two reasons why we are pursuing this effort:

1. Our primary focus is the process to carry forward implementation of Appendix B. This effort falls under the regulatory process element.

2. Our experience with procurement indicates a pervasive compliance culture that we want to investigate.

Several years ago, in response to NRC and industry concerns with substandard fraudulent items, NUMARC attempted to improve industry procurement activities. We underestimated the compliance level of thinking within the industry. It is pervasive. We have a real problem, because we found that we did a lot of things to ourselves—as individual utilities and as collective groups of utilities. NUMARC bears a certain level of responsibility in underestimating the compliance level of thinking. We feel that, in light of the industry-wide initiative and our experience, now is the time to take a good hard look at what we are doing to ourselves and why.

9.4 Glen Perez
Pacific Gas & Electric

I will focus on two areas of quality assurance regulations which could be restructured or eliminated. These two areas are (1) 10CFR50 Appendix B requirements, and (2) the audit subject and frequency technical specification requirement. I suggest that these two areas cause QA to focus on form rather than performance—to follow the letter of quality rather than the spirit of quality—and this has led to a degradation of quality itself.

Appendix B to 10CFR50 provides the regulatory framework that was used to construct the quality assurance programs for today's nuclear power plants. The specific programmatic requirements are revealed in the 18 criteria.

Criterion 1, organization, defines quality functions as those of ensuring that an appropriate quality assurance program is established and effectively executed, and verifying—through checks, audits, and inspections—that activities affecting the safety-related functions have been correctly performed.

The very same criterion determines the structure of our quality assurance programs by stating that the persons and organizations performing quality assurance functions shall have sufficient authority and organizational freedom to identify quality problems; initiate, recommend, or provide solutions; and verify implementation of solutions. Persons and organizations performing quality assurance functions shall report to a management level such that this required authority and organizational freedom, including sufficient independence from cost and scheduling when they are opposed to safety considerations, are provided.

This has led to most QA organizations being functionally independent from the rest of the nuclear organization. Independent organizations such as these, based on so-called quality assurance functions, have emphasized compliance rather than performance—paperwork reviews rather than kicking the tires. These independent organizations have borne the burden of ensuring and demonstrating quality, rather than sharing it with those whose work must actually be of quality.

Criterion 18 audits require a comprehensive system of planned and periodic audits to verify compliance with all aspects of the quality assurance program.

In the classic terms of quality assurance, audits were and still are the major product of QA programs. In general, these audits have been compliance-based, with a concentration on verifying that requirements are met rather than verifying quality performance.

However, we are asked today to look at our QA requirements and discuss areas where we can change, not only to reduce the regulatory burden of these requirements but also to allow utilities to design and implement the programs that are best suited to them. This will ultimately lead to better quality, safety, and plant reliability.

Quality assurance should not emanate from QA but from the entire nuclear organization. So, my first suggestion is to eliminate Appendix B as it is presently written and replace it with a more performance-based regulation. The new requirement would be titled "the assurance of quality." The assurance of quality would not be the sole responsibility of a specific and isolated organization, but rather a philosophy woven into the fabric of the nuclear organization's culture. Assurance of quality consists of the elements that constitute a quality consciousness. It is a management system that requires an integrated approach. As the late Admiral Rickover suggested, it is the concept of total responsibility wherein all elements are recognized as important and each is consistently reinforced. This is quality performance.

The new assurance of quality regulation must emphasize management's responsibilities to develop quality as an in-line function rather than the function of an isolated group. Nuclear organizations will be required to be proactive and play an intrusive role. The assurance of quality will require setting high standards and high expectations. Management must be actively involved, not passively waiting for an audit finding before taking action.

The assurance of quality regulation would be performance-based, simply stated as prevent, detect, and monitor: prevent significant quality-related problems, detect the development of quality problems, and monitor the achievement of the quality process. Although I envision the elimination of the eighteen criteria from the regulations, the 18 criteria—minus criterion 1—nonetheless could be used as the basic tools to create the individual power plant's assurance of quality agenda.

For the regulation to be truly performance-based, it must contain objective measures that the utilities, the NRC, and the public could use to evaluate performance. Here are two examples of objective measures using PRA techniques. One highlights a significance threshold, the other problem trending.

Using PRA techniques, a core damage frequency could be determined that would be considered a significance threshold. Each major problem at a nuclear power plant could be measured for its effect on the core damage frequency. When the problem causes the core damage frequency to exceed the significance threshold, the problem would be considered significant. The primary objective of the assurance of quality would be to prevent problems that could cross the significance threshold. This is a measurable objective.

The second objective of ensuring quality is to detect emerging problems. Using a combination of PRA and risk analysis, the utilities could select plant-specific components for trending. The problem trending of these components and systems at a low significance level would detect developing quality concerns. This, too, is a measurable objective that is performance-based.

At PG&E, we have used objective criteria to select significant quality problems for our Offsite Management Oversight Group to review. We look at our highest tiered quality problem reports and determine whether, if the problem were not corrected, it would (a) cause a violation of the plant licensing basis, (b) significantly increase the probability of an inadvertent plant trip or a forced outage, or (c) cause a reliability impact immediately or in a later plant mode. The use of such criteria has been useful in objectively filtering out the less significant problems and allowing our oversight group the opportunity to concentrate on significant problems.

The second area where I believe we need to emphasize performance versus compliance involves the audit requirements found in plant technical specifications. The technical specifications require audits for specific activities and define the frequencies of these audits. I suggest replacing required audits with various monitoring activities. These

activities would be performance-based rather than compliance-based. I can easily perceive three benefits from the implementation of monitoring activities.

1. Using PRA techniques to rank the systems by their impact on core damage frequency would allow utilities to select the systems to be reviewed based on their significance. This is one input into our selection process for our annual SSFIs.

2. Monitoring activities such as SSFIs, SSOMIs, and vertical slice reviews—rather than audits—could be used to assess the assurance of quality.

3. Since audits would not be required, management could form their review teams with technical experts and not just certified auditors.

These monitoring activities would be management's tools to use when they see the need to determine the achievement of quality, not just compliance with quality regulations.

By eliminating the frequency of activities for specified review, utilities would be allowed to allocate their monitoring resources based on the performance and significance of systems, components, and processes.

I have two examples of performance-based measures that could be used for management to determine the appropriate monitoring frequencies. The first example uses PRA techniques; the second uses criteria similar to SALP.

1. To prioritize plant systems and processes, rank them based on their effect on the increase to the severe core damage frequency. The systems and processes with the lowest risk could have the longest time interval between reviews.

2. Use the criteria from the NRC's SALP program to provide some objective evidence that various systems, components, processes, or functional areas are performing in a manner that would suggest that the frequency of reviews could be curtailed or increased.

In summary, I have focused on two areas of QA regulations that could be restructured or eliminated, Appendix B and the technical specification audit requirements. It is my belief that adopting performance-based techniques and using the tools of PRA could provide for the safe and reliable operation of nuclear power plants. The new regulation of assurance of quality will do just that.

9.5 James Perry
Niagara Mohawk Power Corporation

Views, Experience, and Comments on Quality Assurance Requirements

As Chairman of the ASME Nuclear QA Committee, I have some knowledge in the area of quality assurance and Appendix B. This afternoon, however, I will be expressing my own personal opinions on quality assurance requirements from the perspective of requirements marginal to safety.

10CFR50 Appendix B QA Requirements

- Applies to licensees and applicants
- Basically sound
- Provides flexibility in application
- Primarily oriented to design, fabrication and construction
- Since rather broad, subject to much interpretation
- Has been in use for over twenty years

James Perry - slide 1

Appendix B to 10CFR50 applies to licensees and applicants. Therefore, many people—contractors, suppliers, and others—who have to implement QA programs are not directly subject to those requirements. These people get the requirements through their purchase orders and contracts, and those are translated into different documents, such as NQA 1, ANSI N45.2, or company specifications.

I believe that Appendix B is basically sound. I also feel that it provides the necessary flexibility and application. In other words, it allows us to use a graded approach to quality assurance, the way it was intended to be applied. However, I believe that the primary

focus of Appendix B when it was written consisted of design, fabrication, and construction. The 18 elements are all considered equal, but there is an absence of detail with respect to operations, maintenance, and that sort of thing. You have to interpret these elements.

Since Appendix B is rather broad, I look at it almost as I look at the Ten Commandments. Both are subject to interpretation. We can say thou shalt not kill. However, if I wound someone who doesn't die, did I meet the intent of the commandment?

Appendix B is also subject to interpretation. I would like to solicit everyone's support. We have a lot of experience in applying Appendix B over the last 20-some years, and I think we need to take stock of the many lessons we've learned. Many of our experiences were not good. We should learn from those experiences and look at what we need to change to effectively enhance safety and reliability.

Implementation Experience

- Complexity - ANSI Standards, Regulatory Guides, Standard Review Plan, ISO 9000, 5700 6c, E4, etc.
- Too much emphasis on simply compliance, processes and records, and not enough on performance and results that enhance safety
- Too often program driven by QA departments instead of line organizations
- Misapplication of QA Program requirements in procurement/contract - overkill
- Interpretations of QA requirements by inspectors/audit teams sometimes incorrect - leads to more detail, paperwork that can detract from enhancing nuclear safety

James Perry - slide 2

I think the problem that we face is not the fundamental requirements, but rather the implementation and interpretation of those requirements. I believe we have a proliferation of requirements and guidance in the form of complex ANSI standards, NQA-1, -2, and -3, various regulatory guides, and standard review plans.

Currently, we're talking about international standards, the ISO 9000 series. We have DOE orders, for example, DOE 5700.6C. A new document on environmental quality assurance requirements, ACQC-E4, will be coming out shortly. The list goes on and on.

I think one of the problems we face with the implementation of QA is that we have placed too much emphasis on simply complying with the minimum requirements. We are looking at the processes and records, and failing to look at the results we're achieving, the performance we're getting, whether and how we're really enhancing safety, and whether we're doing the right things. Too often, the program is driven by QA practitioners who study the line organizations. I think it's time for the line organizations to stand up and be counted, and have the QA organization take a back seat. Let the organization drive.

We have also run into misapplications of the QA program requirements in purchases and contracts. Too often, the purchaser is just lazy, imposing 45.2 or NQA-1 without exception, even when the standard clearly doesn't apply to the scope and intent of the procurement activity. That is a misapplication of QA, yet we do it. The supplier will do what is requested, but it costs money and it's counterproductive.

Also, QA requirements are sometimes misinterpreted by inspectors and audit teams. This leads to more detail, more confusion, and more paperwork, which really detracts from our purpose and mission of enhancing safety.

Time to Focus on Changing Emphasis

- Culture change - single-point accountability by line organization for quality
- Defense in depth - individual, supervisor, line management, then assurance groups. In that order
- Shift from compliance base to performance base focusing on results that enhance safety
- Use probabilistic risk assessment (PRA) and individual plant examination (IPE) techniques to guide applying graded approach to QA requirements
- Where impact on nuclear safety and reliability is low - only specify technical requirements, impose no formal QA requirements

James Perry - slide 3

I think it's time for us to focus on change. The change I am talking about is a cultural change, where we talk about single-point accountability by the line organization. The

person doing the design is responsible for quality, the person operating the plant is responsible for quality, and the heck with the QA organization. The attitude that the work is good enough if the QA organization doesn't find a problem is wrong. We have to change that attitude. To change a culture takes time, but we have to continue working on it. I'm glad to see that people are moving in that direction.

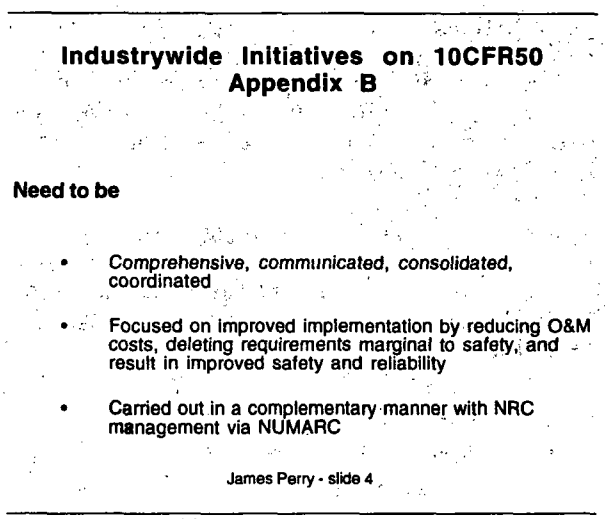
Another thing we fail to recognize in the nuclear business is that we have a defense-in-depth concept. I think we need to apply that concept with respect to QA. I submit that the defense-in-depth level that is most pertinent is the level of the individual, since that's where the work gets done; secondly, the supervisor level; then the level of line management; and finally, the level of the quality assurance organization—not the other way around. That's what's wrong.

We also need to shift the emphasis from compliance-based to performance-based regulation, focusing on results that enhance safety. This is tough to do with audits. You have to audit when somebody is working, not sit in the corner and review the records—which is a lot easier to do. Audits have to be real-time.

We should be applying the techniques of probabilistic risk assessments and individual plant examinations to guide the application of a graded QA program, which is what was intended by Appendix B. We also need to be realistic and recognize that there are instances where the impact on nuclear safety reliability is very low, and therefore we should only specify technical requirements, not QA programmatic requirements. Specifying QA programmatic requirements in such instances is a waste of time and money, yet we do it.

In my view, industry-wide initiatives on Appendix B should be what I call the four Cs: comprehensive, communicated, consolidated, and coordinated amongst all the groups. We need to look at it as a whole, not separate pieces.

I think we also need to focus on improved implementation by reducing our operating and maintenance costs, deleting requirements marginal to safety that really do not result in improved safety and reliability, and putting the emphasis on the right things. This is not a matter of not wanting to spend money. We want to spend it where it yields the biggest bang for the buck.



This effort needs to be carried out in a complementary manner with the NRC management by way of NUMARC—our representative within the nuclear industry.

10CFR50 Appendix B applies to licensees and applicants, and as such, many people that have to implement QA programs are not involved in that from the point of view that they are contractors, suppliers, and so forth.

So, they get the requirements through their purchase orders and contracts, and those are translated into different documents such as NQA-1, ANSI N45.2, or company specifications.

I personally feel that Appendix B is basically sound. I also feel that it provides the necessary flexibility and application, in other words allows us to use a graded approach to quality assurance the way it was intended to be applied.

I do feel, however, that its primary emphasis at the time it was written was centered primarily around design fabrication and construction. If you look at the 18 elements, they're all considered equal, but there is an absence of things with respect to operations, maintenance, and that sort of thing. So, you have to translate them.

Now, since Appendix B is rather broad and general, I look at it almost like the 10 Commandments. It's subject to interpretation.

We can say thou shalt not kill, but if I wound somebody and I didn't kill him, did I meet the intent of that?

So, it's subject to a lot of interpretation, and I'd like to solicit everybody's support. We have a lot of experience in applying Appendix B over the last 20-some-odd years, and I think we need to take stock of the fact that we've learned a lot of lessons.

Many of them are not good, and we ought to learn from those experiences and look at what we need to do to change to make it more effective that will really enhance safety and reliability.

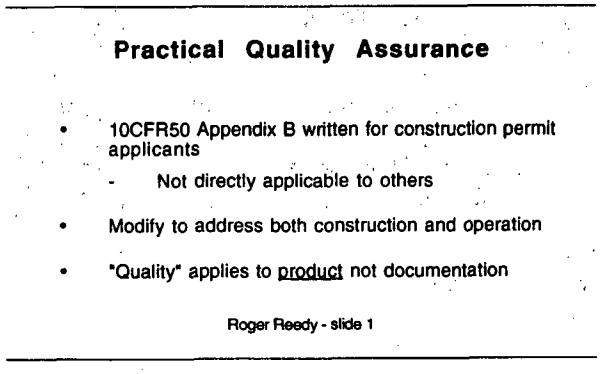
9.6 Roger Reedy
Reedy Associates, Inc.

Practical Quality Assurance (Not an Oxymoron)

Good afternoon. I am Chairman of the ASME Subcommittee 3, which is the construction code for nuclear vessels, piping, pumps, valves, etc. However, I am not speaking for ASME; I am speaking for myself. The views I will present are my own, based on firsthand experience.

Also, I am not here to criticize the NRC, although I will. I am not here to criticize utilities, although I will. I am not here to criticize societies or technical societies, although I will. I will criticize all of us, as there is enough blame in this fiasco to go around to everyone.

One of the things we were asked to do is define performance-based quality assurance.



On my first slide, I have what I think performance-based quality assurance really is. It's practical quality assurance, which is not an oxymoron. An oxymoron, as you know, is a combination of contradictory words, like military intelligence. Practical QA is not a combination of contradictory words.

What I mean by practical QA or performance-based quality assurance is just getting back to basics—where we were when we built structures like the Brooklyn Bridge, which is still standing. It was built according to a quality program, but it would never meet Appendix B criteria. But it's a darn good structure, and it's a quality product.

We have been building quality products as engineers for years. We have not met Appendix B criteria for years. In fact, I don't think we're meeting it now.

When I worked for a manufacturer of nuclear reactors and containment vessels, we built six nuclear reactors in the field, not in the shop. All major welding was done in the field by field workers out of union halls, and all the machining was done in the field.

Guess what? We had no weld repairs on those field welds. We had welding that was 6 inches thick, 8 inches thick, and 9 inches thick, with not one weld repair. For the first time in the history of building nuclear reactors, our field machining was fully in compliance with all tolerances. No shop-built reactor had ever met full tolerances as first specified. That is practical quality assurance.

When we instituted a quality assurance program in the plant, the plant manager was very concerned that some of this "bad stuff" might creep into the other parts of the plant and affect our water tanks, our pressure vessels, and some of the storage tanks. After 2 years of implementing a good QA program, he went to management and said he wanted to incorporate that program for all structures. Why? Because he did not have nonconformances, which saved money, and he could do a better job. That's when you know you have a good quality program, and it's not whether or not you have met Appendix B requirements.

I can build something according to Appendix B requirements and have it be of lousy quality. I can build something according to Appendix B requirements and have it be of great quality.

The two are not related. Appendix B does not guarantee a quality product.

General Problems

- Appendix B now used as a substitute for good management
- Too often equipment accepted or rejected by non technical people who do not understand technical requirements
- Norm has been substitution of quantity of documentation for quality of equipment
- Today's interpretations reduce the quality of products and plant safety

Roger Reedy - slide 2

We are all to blame in this. We have all jumped in feet first, and we have taken on the idea that these criteria in Appendix B were handed down on a tablet of stone in a desert. They were not.

No one is complying with Appendix B because we are all relying on paper and documentation; the requirements call for us to review objective evidence. The NRC doesn't spend a lot of time reviewing objective evidence, we don't spend much time reviewing objective evidence, and from what I have seen, NUPIC spends no time reviewing objective evidence.

Reviewing objective evidence means reviewing performance, and that is what Appendix B currently says. That is not what we are doing. We are looking at paperwork to determine whether or not we can ship.

As chairman of the code committee, I am trying to support changing the rules so they become more practical, and I keep getting interference from people who say the NRC will never accept that change. Jim Perry and I are now working, through the ASME code committee and through NQA 1, respectively, to see if our two groups can come up with a practical approach to quality assurance. We solicit the help of everyone who is interested in better products.

I am not talking about decreasing safety at all. I am talking about increasing safety, because the way we are doing the job today does not promote safety. It promotes paperwork.

I would like to point out that sometimes the NRC and other people come up with interpretations of the ASME code, as it relates to quality assurance or anything else, and provide interpretations that say the ASME code requirements are not met. That's nonsense.

General Comments

- Establish an NRC/Utility Board of Appeals for NRC documented violations of Appendix B
- Define 'nonconformance' as "a deficiency in characteristic that renders the quality of equipment unacceptable"
- Management may determine different levels of concern for nonconformances
- Engineering is responsible for establishing and interpreting both quality and technical requirements for equipment
- Only one signature is required on a document
- NRC concerned about 10 violations - only one affected hardware
- TVA required to evaluate 2500 welds. Only one was technically questionable. Took 4 years.

Roger Reedy - slide 3

The only group of people entitled to or responsible for officially interpreting the code is the ASME code committee. The NRC, the state, and authorized inspectors can give you opinions, but they are not interpretations.

The next item is commercial-grade products. From what I have seen regarding the industry effort on commercial-grade products, it's an absolute abomination. It increases the cost tremendously, by factors of maybe 1,000. It does not ensure a great product.

In my opinion, a short time ago the code committee did a stupid thing in when we put QA requirements on materials. By doing that, we encouraged people to give us great documentation, because no one would ever check the materials. That has to change. We have to test materials and forget about the QA documentation.

General Comments (continued)

- ASME Code
  - Only ASME can provide official interpretations of ASME Code
  - Many utilities being cited for conditions which are in compliance. This is an injustice and could result in an adverse safety condition
  - NRC cited utilities for Code violations on Class 3 piping. They required radiographs on welds not intended to be radiographed
- Commercial Products
  - Commercial products which have an extensive acceptance and safety record should be allowed
- Information Notice 90-05
- 90-05 should be voided because it is based on an erroneous assumption that Code prohibits through-wall leakage
- Intimidation
  - NRC Regulations regarding intimidation of inspectors has resulted in reverse intimidation
  - Some QA personnel have used the ruling to become dictators and create conditions adverse to quality

Roger Reedy - slide 4

I wrote my first QA program back in 1965, which was before the NRC wrote Appendix B or even Appendix A. You can have a good way of working together, ensuring that you are meeting the specifications, without making sure that every document is correct.

We have had cases where plants have torn out piping because they lost the paper that identified the certified material test report for that piece of pipe. That is pretty stupid. We have had other cases where people have been so prescriptive with their procedures that they have identified how to get from one point to another. A good QA program identifies that you have met your objective when you get to where you were going. It is not concerned with how you got there as long as you met the requirements and didn't hurt anything in the process.

In conclusion, I ask for your help. The people on the code committee are trying to come up with a better document. We need cooperation and coordination. I saw a lot of heads nodding when I said you could produce a good product and not have a good Appendix B program. We have to let that voice be heard. In my mind, Appendix B is not related to good products.

Design Control

- Designs are controlled by qualified engineers, not procedures
- Engineers are responsible for all assumptions in any computer program they use
- Require Registered Professional Engineers for all safety related engineered products
- Require the engineer to be responsible for his work
- Require engineers on all peer reviews
- Require NRC reviewers of engineering designs to be Registered Professional Engineers

Roger Reedy - slide 5

Several slides were provided to workshop participants but were not presented due to time constraints. These are found at the end of this chapter, after the open forum discussion.

9.7 Herschel Specter
New York Power Authority

Repeatedly during these last few days, we have heard about the possibility of using PRA risk techniques. Specifically, on this panel and earlier, a connection was made between PRA and QA.

I would like to offer for discussion something the Power Authority recently submitted in response to a request to comment on Regulatory Guide 1.28, and to offer different risk insights.

I want to give you my thoughts on how PRA may be of use and significance in the QA process. The upper left-hand box on the slide contains a question: Is the system, structure, or component (SSC) risk-significant based on some PSA ranking process?

A lot of people across the country are using PRAs in ranking processes like this. You heard earlier that the total number of risk-significant components—be they out of NRC-sponsored work or industry-sponsored work—is probably somewhere between 200 and 1,000. That is a plant-specific number. But clearly, it is a smaller number than most people think. If we just looked at that very first box on the slide and stopped there, it wouldn't surprise me if the size of these QA programs and Q lists would be smaller by

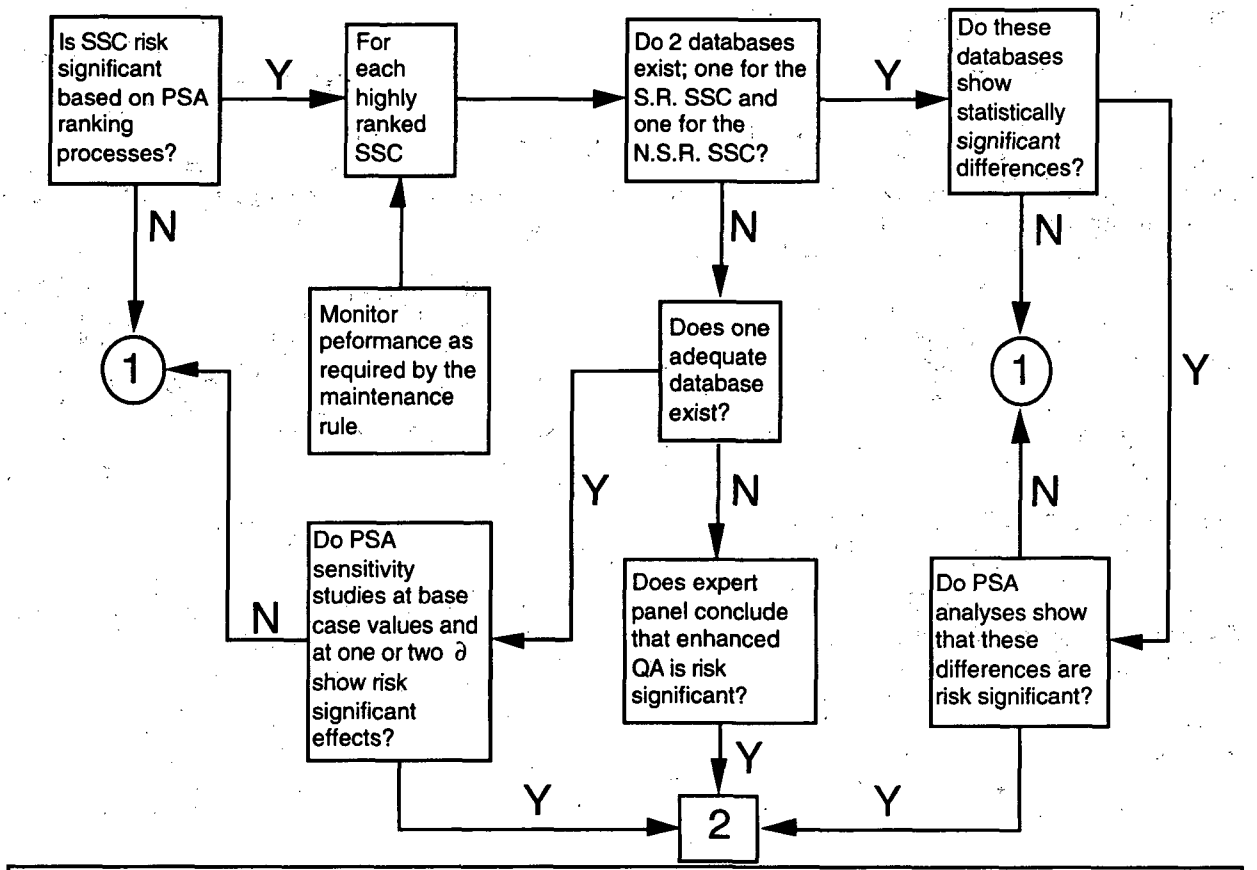
roughly a factor of 10. So if it became part of our QA process, box number one in and of itself would represent an order of magnitude improvement in what we do now to identify what is truly important.

Let us assume that we have performed our PRA analysis and found that, by some agreed-upon ranking process, a particular SSC is not important to risk. My recommendation would be to use normal commercial QA practices. A lot of you know that normal QA practices are pretty sophisticated already. So, if it is the determination of the PRA analysis that a particular SSC is not risk-significant, then it's reasonable to use normal practices.

However, what happens if you decide that the component is indeed important to safety? You move two boxes to the right, and there's a box containing the question: Do two different databases exist, one for safety-related systems, structures, and components, and one for non safety-related systems, structures, and components? Let me elaborate a bit on that.

Quite often, we can find pairs of components. For example, here is a valve that has gone through the normal QA process and is labeled safety-related; this is what some people call gold-plated. Here is more or less the same

Figure 9.7.1
Application of Risk Perspectives to the QA Process



valve used for the same type of duty, but in a non safety-related application—not necessarily in a nuclear plant, but perhaps in a chemical plant. People have experience on the operation of these two classes of valves—these twins—one safety-related and one not. Let's take a look at the databases to see if the actual performance of the two valves is statistically different.

EPRI has conducted an initial effort in this direction, and I understand they are going to expand upon that effort. To date, when EPRI has compared the twins—the safety-related components with their non safety-related counterparts—they have not found any statistical difference in the performance of the components. If the actual performance databases do not show a statistical difference, then I would recommend using normal commercial QA practices. Eventually I would recommend using commercial practices even for a highly ranked component, i.e., one that is risk-significant, if there is no statistical difference in performance.

Now let's take the opposite point of view. Suppose I have a highly ranked component, I have two different databases, and I find that the performance is statistically different. Does that automatically translate to a large risk difference? Not necessarily.

I can plug the two different performance values, one from my QA database and one from my commercial database, into my PRA to see how each affects the core melt frequency.

Quite often, there will not be much of a difference. Let me explain why. A primary reason for doing QA is to ensure a certain reliability. But when you ask yourself about components, particularly active components—how do they fail and what is the role of QA in reducing that failure rate—you find that a lot of components fail either because of human error or because of a common-cause failure, such as loss of electric power. This strikes down any number of components simultaneously, and that particular common-cause failure may or may not be related to QA. If it is related to QA, you need to make changes in the system that is affected, not the derivative systems that depend on the electric power.

In other words, most of the reasons components fail may not be a function of the QA process. So, I can have two databases that vary a lot, but when I plug these two numbers into the PRA, the impact on core melt frequency may be negligible.

If you take these two different numbers, plug them into your PRA, and do not find a risk significance, I would suggest again that you use commercial QA practices.

What do you do if you do not have two different databases for comparing the twin components, that is, you only have one? Some statisticians have suggested you can find a median value out of the database—for example, a median value for failure rate—and go one or two sigmas or standard deviations around this median point, and then you would probably encompass a great deal of the practice.

Put the median value into your PRA and put in something at 2 sigma and plug it back into your PRA. In effect, you're creating two databases. See if that has an impact on your core melt frequency. If it does not, once again I would suggest that you use commercial practices.

If you are not happy with the available data, a standard practice that has been used (e.g., in NUREG 1150) is to have an expert elicitation panel. There are many people who know, from their vast experience, whether or not the QA processes will really bring about a change in the performance of the components when they are used the way they are used in a plant. If that committee is looking at some specific set of components and it's their judgment that the QA process has a great impact, then you should go forward with that process.

To summarize, we can determine, with a high degree of accuracy, which components are safety-significant and which are not. For those components that are classified as safety-significant, there are additional risk techniques to determine whether the QA process is safety-significant, even for the important components. I urge that we use those techniques now.

9.8 John D. Stevenson
Stevenson Associates

Quality Assurance in the Nuclear Power Industry
A Critique and Some Recommended Changes

I will briefly discuss the following four topics: the need for a graded approach to quality assurance, examples of document versus performance QA, negative aspects of current QA practice, and the one that I think is probably the most important—a comparison of simplified DOE 5700.6.C with 10CFR50 Appendix B QA program requirements.

Topics

1. Need for a graded approach to quality assurance
2. Examples of document versus performance QA
3. Negative aspects of current QA practices
4. Comparison of simplified DOE Order 5700.6C to 10CFR50 Appendix B QA Program Requirements

John Stevenson - slide 1

The graded approach to quality assurance is based on the assumption that we have a very well-defined graded approach to quality.

Graded Approach to Quality Assurance

In NRC Regulatory Guides (e.g. Reg Guide 1.26) there are four levels of quality classifications. A similar graded approach should be taken for quality assurance. Three levels of quality assurance are proposed

John Stevenson - slide 2

In NRC Regulatory Guide 1.26, there are four levels of quality assurance, A through D. The use of a similar graded approach would seem to be logical with regard to the quality assurance that ensures the quality of the standards and the components defined by that regulatory guide. I am proposing that we really need, in the future, three levels of quality assurance, not a single level of quality assurance that we continuously strive to attain and never quite get to.

Recommended Level 1 QA Program to be used for Reg Guide 1.26 Quality Classes A and B

1. Provides for the development of a detailed QA manual which regulates all aspects of the QA Program.
2. Provides for the formation of a project or facility independent QA organization to monitor project QA.
3. Provides for the formation of a project or facility dependent QA organization to assist project management in fulfilling its prime responsibility for QA.
4. Provides for formal audit (administrative and technical) on a sample basis of project or facility activities related to quality.
5. Mandates a formal procedure for resolutions of non-conformance identified between "as designed" and "as built" construction or installation.

John Stevenson - slide 3

The recommended level-one quality assurance program, which would be applied to components in quality classes A and B as defined by Regulatory Guide 1.26, would do the following:

1. Provide for development of the detailed quality assurance manual that regulates all aspects of the quality assurance program;
2. Provide for the formation of a project- or facility-independent quality assurance organization to monitor project quality assurance;
3. Provide for the formation of a project- or facility-dependent quality assurance organization to assist project management in fulfilling its prime responsibility for quality assurance (under the new order, quality assurance would be the responsibility of the facility and project management, not the responsibility of a quality assurance organization);
4. Provide for formal administrative and technical audits on a sample basis of project or facility activities related to quality; and
5. Mandate a formal procedure for resolving nonconformances identified between as-designed and as-built construction or installation.

We would expect components that form, for example, part of the reactor coolant system and the engineered safety systems to fall under the level-one quality assurance program.

Recommended Level 2 QA Program to be used for Reg Guide 1.26 Quality Class C

1. Provides for the development of a quality assurance manual which regulates the QA Program usually by reference to applicable regulatory contract or project and owner policy, and operating procedures and contract requirements.
2. Provides for independent administrative and technical audits of a selected sample of project or facility activities related to quality.
3. Provides for the formation of a project or facility dependent QA organization to assist project or facility management in performing their QA responsibility.
4. Requires documented resolution of non-conformance identified in the field.

John Stevenson - slide 4

A recommended level-two quality assurance program would be applied to components in quality class C as defined in Regulatory Guide 1.26. This program would reduce some of the requirements and do the following:

1. Provide for the development of a quality assurance manual that regulates the quality assurance program, usually by reference to applicable regulatory contractor, project, and owner policy, procedures, and contract requirements;
2. Provide for independent administrative and technical audits on a selected sample of project or facility activities related to quality;
3. Provide for the formation of a project- or facility-dependent quality assurance organization to assist project or facility management in performing their quality assurance function; and
4. Require documented resolution of nonconformances identified in the field.

Recommended Level 3 QA Program to be used for RG 1.26 Quality Class D

1. Provides for the development of a quality assurance manual which regulates the QA Program usually by reference to applicable regulatory contract or project and owner policy, and operating procedures and contract requirements.
2. Mandates a QA Program be the responsibility of and administered by project management in accordance with applicable regulatory contract or project and owner specified policy and operating procedures and contract requirements.
3. Usually includes no scheduled audit function.
4. Provides for resolution of non-conformance identified in the field as provided by contract. Generally, this procedure is performed by field engineers who are competent to evaluate intent of design and who are allowed to use judgment in evaluation significance of non-conformance.

John Stevenson - slide 5

Finally, we would have a level-three quality assurance program, which would be applied to components in quality class D as defined in Regulatory Guide 1.26. Generally, this is a baseline requirement that would be used for any industrial facility. For example, a fossil-fired power station basically would follow the requirements of a level-three quality assurance program, which would do the following:

1. Require a quality assurance program by reference to applicable regulatory contract, project, and owner policy, operating procedures, and contract requirements;
2. Mandate that the quality assurance program be the responsibility of and administered by project management in accordance with their standard operating procedures;
3. In general, not require a scheduled audit function;
4. Provide for resolution of nonconformances identified in the field—as provided by contract—by field engineers who are competent to evaluate the intent of design and who are allowed judgment in evaluating significant nonconformances.

You can see that there is a graded approach not only to the standards that define quality, as

expressed in the regulatory guides, but also to quality with regard to quality assurance.

Examples of "Document" vs. "Performance" QA

Material:

Document - Certified mill tests reports required on all structural steel installed in the job to insure proper material is used. This results in an administrative nightmare where every steel member including attachments through material procurement, fabrication, shipping, receipt, and installation must retain its identity as to heat number and location within a fabricated assembly.

Performance - At receipt on the job site, sample incoming steel to insure it has the minimum specified chemical, mechanical and *dimensional properties as contained in applicable specifications.*

John Stevenson - slide 6

"Document" versus "performance" quality assurance is an issue that all of us face. One example is a tendency to require certified mill test reports for all the structural steel in a job, which follows the particular item through the entire fabrication and installation procedure. This creates a nightmare of documentation, if *nothing* else; it is a *document-oriented* program on material. A performance approach would be to sample incoming steel on receipt at the job site to ensure it has the minimum specified chemical, mechanical, and dimensional properties as contained in the applicable specifications. The document approach would be replaced by a simple sampling technique similar to what we use to control manufacturing quality.

In the area of design we have a tendency to perform an independent verification of all design documents. Sometimes these verifications aren't performed until the plant is ready to go on-line, which is about 4 years after you constructed the particular item that is to be verified. If you find something wrong, it's too late to do anything about it. The result is that you sharpen the pencil and recalculate. There is an old adage that says analysis always rises to design. Ninety-five to 100 percent of the time, we can analyze it in a way to make it work.

Examples of "Document" vs. "Performance" QA (continued)

Design:

Document - All design documents, plans, specifications, calculations, etc. verified by independent design reviews outside of the group performing the original design. This typically results in years-long backlogs for such verification such that the design in questions has already been built long before it is verified.

Performance - All plans and specifications verified by originator, checkers and approvers from the group performing original design prior to release for construction. On a small sample basis individual designs would also be peer reviewed and possibly technically audited.

John Stevenson - slide 7

Instead of doing that, let's do what we used to do—prepare plans and specifications that would be verified or signed by the originator, checker, and approver for the group performing the original design prior to release for construction. On a small sample basis, individual designs would also be peer-reviewed and, possibly, technically audited.

Examples of "Document" vs. "Performance" QA (continued)

Fabrication:

Document - Each weld would have a file folder which would include identification of and a copy of the individual welder's certification, weld procedure, log of receipt and turn in of welding rod used, certificate of welding rod temperature and humidity storage control, certificate of all required weld quality control examinations

Performance - Visual or other inspection of finished weld by qualified welding inspectors capable of evaluating the workmanship in accordance with applicable code requirements plus certification of all required weld quality control examinations had been performed.

John Stevenson - slide 8

We can use a similar approach for fabrication. Right now, on each weld we have a folder that includes the following typical information: individual welder certification, weld procedure, log of receipt and turn-in of welding rod used,

certificate of welding rod temperature and humidity storage control, and certificate of all required weld quality control examinations. What we really need is a visual inspection of the finished weld by a qualified weld inspector who is capable of evaluating the code requirements and workmanship in accordance with code requirements, plus certification of all required weld quality control examinations. In short, send a person who knows what a weld is supposed to look like to the site and let him or her evaluate and sign off on the weld, rather than look at a file folder for each weld.

Perhaps current requirements would not be so bad if they were just expensive and not very effective. But the truth of the matter is quality assurance, as we now practice it, has negative impact on quality. I will list some of the negative impacts.

Negative Aspects of Current QA Practices

1. The current emphasis on QA documentation makes the documentation pedigree of a component valuable, often more valuable than the component itself, thereby encouraging its counterfeiting or falsification.
2. Removes responsibility for QA from the organization performing the construction or maintenance activity. In general quality cannot be inspected into a project. Fosters a "them" versus "us" mentality where the project organization is no longer responsible for quality.
3. Replacement parts become much more expensive and difficult to obtain under current QA requirements. As a result parts are continued in service well beyond their optimum reliable life.
4. Adds significantly to project and facility costs (typically a total 30-35% cost increase) without any quantifiable increase in reliability or safety.

John Stevenson - slide 9

First, the current emphasis on quality assurance documentation makes the documentation pedigree of a component valuable—often more valuable than the component itself—thereby encouraging its counterfeiting or falsification. We are all aware of examples where this has happened. A number of I&E bulletins have exposed this practice.

If you tell me that installing structural steel costs $1 a pound using normal AISC, while the same design by ASME, Section NF, is going to cost $5 a pound because of the paper pedigree, I'm going to be very tempted to install the $1 steel, falsify the paperwork, and put the remaining $4 in my pocket. Unfortunately, human nature being what it is, that is probably not an isolated situation.

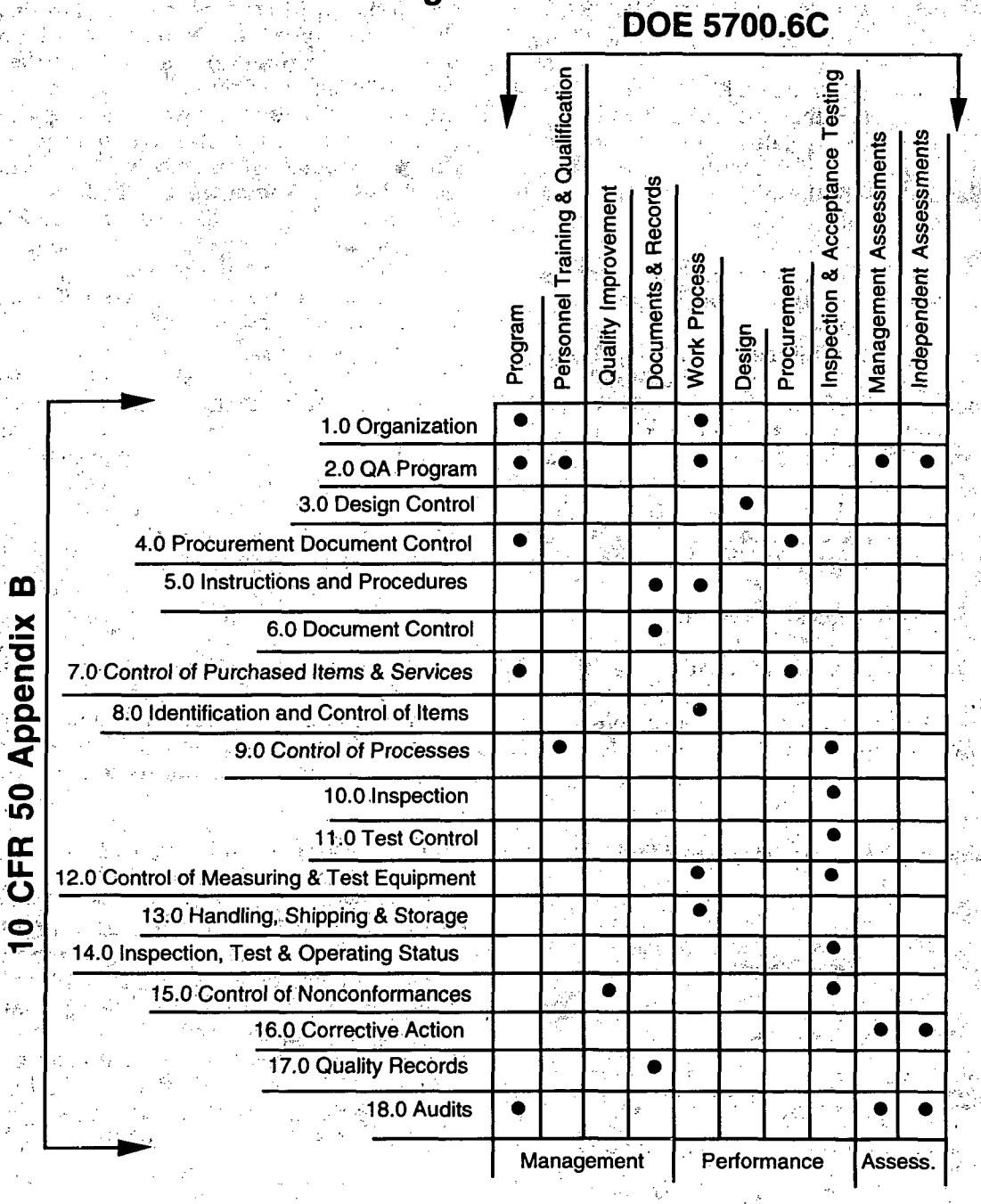
Second, current QA practices remove the responsibility of quality assurance from the organization performing the construction or maintenance; in general, quality cannot be inspected into the project. A "them-versus-us" mentality is fostered when the project organization is no longer responsible for quality.

Third, replacement parts become much more expensive and difficult to obtain under the current quality assurance requirements. As a result, parts are continued in service well beyond their optimum reliable life. I think this is particularly true for the older power stations. Since the parts were originally procured as commercial items, plants are not anxious to replace them with QA items, as that typically results in a 30-percent to 35-percent increase in the project or facility cost without any quantifiable increase in reliability or safety.

Finally, I want to make a comparison between 10CFR50 Appendix B requirements and the relatively new DOE 5700.6C. (See Figure 9.8.1) I think DOE 5700.6C certainly could constitute the blueprint for a modified QA procedure for the Nuclear Regulatory Commission and the commercial industry in the future. The streamlined DOE 5700.6C has been around for approximately 18 months. In effect, it has 10 criteria as opposed to Appendix B's 18. Of those 10 criteria, the first 9 are the responsibility of the project or facility management, not the responsibility of the quality assurance organization. Only in the area of individual, independent assessment does QA operate independently of the project.

In my opinion, this is the beginning of what I would consider rational and practical QA.

Figure 9.8.1



9.9 Don Hill
Washington Public Power Supply System

Imposing a Regulatory Burden

I appreciate the opportunity to speak on a subject that so many of us know so little about—coatings. Earlier we heard that we had overreacted in the 1970s, when ANSIs were written; such was the case in the coating industry. Coatings are glorified paints, but they have caused a considerable amount of concern with a number of plants.

The ANSI documents were endorsed by Regulatory Guide 1.54: ANSI 101.2, which was the testing standard, and ANSI 101.4, which was the quality assurance standard; and

Regulatory Guide 1.54, which is what we use to determine how to comply with 10CFR50, Appendix B.

Who said coatings were safety-related? In looking back, I see that the coating industry said they were safety-related, so safety-related coatings were born. The coating industry has been plagued with these requirements ever since, and so have the utilities.

At that time, the basic 10 coating companies put their best foot forward and blasted steel panels. They conducted their ANSI testing and passed, never thinking that in the future we would be faced with a maintenance issue—we cannot blast within the level-one areas of a nuclear plant. Now, the health physicists would come off their seats if we came in and prepared the coating systems the way we prepared them back in the early days. The state-of-the-art has changed drastically since the late 1960s and early 1970s.

Are coatings, in fact, safety-related? We in the industry said they were. However, if the panel were asked today whether coatings, if they come off, would plug the sumps and screens to interfere with the safe shutdown of the plant in the unlikely event of a LOCA, we would say, "no."

Imposing a Regulatory Burden

Coatings for Level 1 areas defined under the present regulatory position are Safety Related.

- Are they in fact "Safety Related"?
- Will coatings, if they come off, plug the sumps and screens to interfere with the safe shut down of the facility in the unlikely event of a LOCA?
- It is assumed all coatings will come off at the same time
  - Will they? No - impossibility due to location of the coated item having different exposure conditions, temperatures, ext.
- Openings to the sumps, screens, and pumps are wide enough to allow passage of paint chips
- Placement and design of the ECCS components are such that curbs and direction of flow would prevent "blockage" or build up

Don Hill, P.E. - slide 1

Will they? It is impossible, due to the locations, different exposure conditions, and different temperatures of the coated items, for all of the coatings to come off at the same time. Openings to sumps, screens, and pumps are wide enough to allow paint chips to pass through in the event there is a need to shut down the plant. Coatings will not interfere with the safe shutdown of the facility. The placement and design of the emergency component cooling system components are such that curbs and the directional flow would prevent the blockage or buildup of a coating material to stop the recirculation.

When ANSI was developed, there were a number of testing standards in place. One standard was how well a coating adheres. In ANSI today, we have a requirement of 200 pounds. However, with new technology, we can exceed that. It is not unusual to get a new, state-of-the-art material that will yield 800 psi or 1,000 psi—better adhesion.

Back then, the coatings were 40% to 60% solids. Today, with the VOC regulations imposed on the coating industry, it is not unusual to have 70 percent to 99 percent solids. The generic types available back then were limited. Today, the field is wide open, with urethanes, high-solids materials, and epoxy mastics.

Yet, this new technology has not been put into place for the maintenance of a nuclear power facility, as we touched on earlier. The cost of doing this qualification is in excess of $20,000 per sample. In today's economy, the coating manufacturers take a double look at this. They can make more money selling elsewhere. So, we're stymied. We're caught trying to make old technology do what it cannot do. I have heard many times that best effort will apply, but best effort with old coating technology is doomed to failure.

Conclusion

Coatings used in Level 1 (QCI) areas of a nuclear power plant are not "Safety Related" and could not interfere with the safe shut down of the facility

Don Hill, P.E. - slide 2

In conclusion, coatings used in level-one areas of a nuclear plant are not safety-related and

could not interfere with the safe shutdown of the facility.

I would like to see a number of things happen:

1. Remove coatings from the umbrella of 10CFR50, Appendix B;

2. Allow industry to use the present state-of-the-art technology; and

3. Limit the testing burden that has been imposed upon both the coating manufacturer and the utility.

Advantages for declassification of coatings as "Safety Related"

1. New advanced technology could be used for more effective corrosion protection. This would include *surface tolerant high build coating materials now* proven in the industrial field but hindered due to the "regulatory burden" requirements.

2. Less exposure to radiation; ALARA concerns would be lessened since more corrosion protection could be applied in less time.

3. Considerably less expense to the utility since costly ANSI N 101.4 documentation would be less and ANSI N 101.2 testing would not be needed. More meaningful "job specific" performance testing would be substituted.

Don Hill, P.E. - slide 3

What are the advantages?

1. New, advanced technology could be used for more effective corrosion protection. This would include surface-tolerant coating materials now proven in the industrial field but hindered in the nuclear field because of the regulatory burden.

2. Exposure to radiation would be reduced if these new materials were used for maintenance purposes. ALARA concerns would be reduced since more corrosion protection could be applied in less time. We could put twice the mileage on in the same amount of time that it would take to put half the mileage on with an obsolete coating material.

3. Utilities would incur considerably less expense since costly ANSI N101.4 documentation would be reduced and ANSI N101.2 documentation would not be needed. We would test to plant-specific conditions.

Enforce Quality Control by:

- Qualified Workman
- *Use of physical testing verification rather than* outdated "paper trail" of ANSI N 101.4 or ASTM which is reflected in the SAR of each nuclear utility

Don Hill, P.E. - slide 4

With reliable back-up data, the NRC should allow the use of commercially available coating material. In Germany, for example, they are using moisture-cured urethanes.

I was in Japan as a consultant to GE. I had fits when I walked into the suppression chamber and they were painting with water below and high humidity. I told them they couldn't do that, and they said they could because they were using technology that would allow coating application on a moist surface. Here, we would have to use a dehumidifier to make sure the coating would work.

We could enforce quality by qualified workers and the use of physical testing verification rather than the outdated paper trail of ANSI N101.4.

- Since coatings are not a safety related item, eliminate the need for a costly 10CFR50.59 review.

Don Hill, P.E. - slide 5

So, coatings are not safety-related. Most utilities, when you say you want to change the SAR, go into orbit; this would be less likely to happen with proven technology, i.e., coatings that have proven themselves in the industry.

In conclusion, let's focus on areas that are problem areas and reduce focus on those areas that have little impact on safety. Let's understand the causes of corrosion and understand what safety-related means. For example, a safety-related pump does not require a safety-related coating if the pump is outside a level-one area. That is clearly misunderstood within the industry.

The NRC is already represented on ASTM D-33. It would be beautiful if we could work through the NRC, through Ed Woolridge, and reach the point where we are using performance criteria rather than outdated technology.

9.10 Open Forum Discussion Summary

Douglas Brown
Commonwealth Edison:
An undercurrent heard in the other sessions, that industry has learned to live with the rules and any changes from the status quo would cost too much, was not heard in the presentations on quality assurance. We may not want change but we need it. The viability of the nuclear power industry depends on an ability to respond and to change.

Roger Reedy
Reedy Associates, Inc.:
A good practical program that exists in industry today is the Department of Energy Order 5700.6C on Quality Assurance, and it is a proper interpretation of 10CFR50 Appendix B requirements. An example of a misinterpretation of QA requirements was the inspection of 2500 welds that TVA was required to perform at Watts Bar. Only one of the welds was found to be technically questionable, and the inspection program took 4 years.

Skip Copp
Duke Power Corporation:
We support Hershel Specter's proposal to return practicality to the QA process. Much flexibility is available to licensees now. Duke Power has eliminated its separate quality assurance organization, putting the responsibility for quality assurance into the line organizations, with independent verification of quality. I believe we have also moved a lot of our audit frequencies out of the Technical Specifications.

Charlie Bergeron
Grove Engineering:
Have the panelists considered applying some features, of the French QA program for example, vendor qualification, to the U.S. program?

Roger Reedy
Reedy Associates:
At a recent international QA conference, it was discovered that most countries are using 10CFR50 Appendix B as their guidelines, but are applying a less rigid interpretation of the requirements. A British conference attendee suggested that the problem with the U.S. QA program is a too legalistic interpretation of the regulations.

Charlie Bergeron
Grove Engineering:
Vendors are unwilling to qualify upgraded equipment and sell us old equipment because it has been qualified under their written procedures.

Roger Reedy
Reedy Associates:
ASME is losing suppliers of qualified equipment, with the result that it is very costly. Identical equipment, not built under the nuclear program is flourishing.

Gil Millman
NRC:
What can the national codes and standards organizations do to help improve the implementation of existing QA programs?

Jim Perry
Niagara Mohawk Power Corporation:
The ASME Nuclear QA Committee has tasks pending to look at QA requirements and a graded approach to QA. We should use risk assessments to identify which requirements are really important and describe how best to implement them, using these conclusions to revise the NQA standard, and then trying to get NRC endorsement.

Alex Marion
NUMARC:
National codes and standards development efforts need better coordination and more utility participation. However, the concern expressed that the best, most professional efforts of the standards groups might not be accepted by the NRC is a significant issue that deserves serious, serious consideration.

Roger Reedy
Reedy Associates:
The NRC and industry need to get away from the post-TMI strict interpretation of the QA requirements and back to what is practical and useful. Although the principles in Appendix B are sound, it is necessary to change Appendix B to signal a change in implementation.

Hugh Gelston
Florida Power Corporation:
Whatever the rules say, problems arise whenever an inspector's opinion differs from that of the licensee. It is important to ensure that inspector training results in opinions that are consistent with those of upper NRC management.

Roger Huston
TVA:
Although the industry can live with Appendix B by changing other things to make sense, it is better to follow Roger Reed's recommendation to make changes in the basic structure.

Additional Slides

These slides were provided by Roger Reedy to workshop participants but were not discussed due to time constraints.

Appendix B Revisited

Emphasize:

- QC is part of production
- QA provides an overview function, not an approval function
- Engineering is responsible for resolving quality issues, not QA
- "Quality" applies to hardware not documentation
- QA Program interpretation is management's function
- "Objective evidence" means firsthand knowledge of hardware and activities
- Documentation is "subjective evidence" and its value is minimal to quality
- Corrective action is only necessary for conditions adverse to quality
- Records to be retained should be based on the essential data, not record name
- Lost records do not mean there is a problem
- Audits for practical QA means upgraded auditors required

Roger Reedy - slide 6

Criteria I
Organization

- Emphasize:
  - Quality control is part of production
  - QA is an overview function
  - Assuring production compliance with specification
- Management has the final responsibility for product quality
  - Engineering responsible for resolving quality issues
  - "Quality" applies to product not documentation

Roger Reedy - slide 7

Criteria II
Quality Assurance Program

- Quality Assurance Program should be outline for work activities
  - Must be flexible to be practical
  - Interpretation is management's responsibility
- Indoctrination and training must be carefully reconsidered
  - 25% to 33% of time is spent on training and 90% of that is not related to assignments
  - On-the-job training is best

Roger Reedy - slide 8

Criteria III
Design Control

- Design control is best accomplished through hands-on supervision
  - Use of design procedures can cause errors
  - Checklists detract attention from doing the job right
- Only adequately reviewed by peer designers
- Supervision far more effective than checklists
- Defining author as being solely responsible
- Benchmarking of computer programs is unreliable and dangerous
  - Different computer programs may give results with 25% variance
  - Engineers responsible for all technical assumptions in computer programs used

Roger Reedy - slide 9

Criteria IV
Procurement Document Control

- Good guidance, but has no direct impact on quality
- Requires passing on technical requirements to suppliers
- Criteria states "to the extent necessary"
  - Does not require all suppliers to have 18 Criteria

Roger Reedy - slide 10

Criteria V
Instructions, Procedures and Drawings

- Important words are "appropriate to the circumstances"
- Emphasis should be placed on items that directly affect quality of product
  - Welding, not QA Programs, directly affect quality
  - Inappropriate assumptions of tolerances; severely increased costs with direct reduction in quality and safety.

Roger Reedy - slide 11

Criteria VI
Document Control

- Neglected words are "which prescribe all activities affecting quality"
- Typical activity which affects quality is welding

Roger Reedy - slide 12

Criteria VII
Control of Purchased Material, Equipment and Services

- Requires objective evidence that equipment and material meet technical specifications
- Objective evidence demands review of activities
  - Documents are only subjective evidence

Roger Reedy - slide 13

Criteria VIII
Identification and Control of Materials, Parts and Components

- To "preclude the use of incorrect or defective material, parts and components"
  - Marking and identification of parts or pieces unnecessary if system prevents the use of incorrect or defective items
  - Gate theory is adequate

Roger Reedy - slide 14

Criteria IX
Control of Special Processes

- No significant problems of misinterpretation

Roger Reedy - slide 15

Criteria X
Inspection

- Inspection is a production function
  - "Hold points" only required when further work would preclude required inspection

Roger Reedy - slide 16

Criteria XI
Test Control

- Purpose is to assure equipment can operate in a satisfactory manner
- Management or engineering should establish when testing required
  - Tests only required for equipment which must be demonstrated that it will perform satisfactorily in service
  - Previous tests of similar equipment is adequate
  - Design may preclude testing

Roger Reedy - slide 17

Criteria XII
Control of Measuring and Test Equipment

- Emphasize "properly controlled, calibrated, and adjusted", and "within necessary limits"
- Calibrate only required by engineering

Roger Reedy - slide 18

Criteria XIII
Handling, Storage, and Shipping

- Required "to prevent damage or deterioration"
  - Required measures to be identified by the engineering group
  - Some people have sealed the ends of piping to "prevent "damage" with the result that moisture collected inside the pipe and corroded it

Roger Reedy - slide 19

Criteria XIV
Inspection Test and Operating Status

- Applies only "where necessary to preclude inadvertent bypassing of such inspections and tests"
  - Interpreted to require the markings regardless of whether final acceptance inspection was adequate

Roger Reedy - slide 20

Criteria XV
Nonconforming Materials, Parts or Components

- Only intended to preclude inadvertent use of nonconforming items
  - Does not apply to documentation
- Should provide for release of nonconforming items where the risk is acceptable and can be controlled

Roger Reedy - slide 21

Criteria XVI
Corrective Action

- Only required for "conditions adverse to quality"
  - Does not apply to documentation or records
- Purpose is to understand the cause and take corrective action to eliminate the concern
  - Questionable condition should be evaluated, but are not unacceptable before evaluation

Roger Reedy - slide 22

Quality Assurance Records

- Criteria state "sufficient records", not all records
- Records identified by name, but should identify required data

Roger Reedy - slide 23

Criteria XVIII
Audits

- Requirements for QA should stress need for qualified technical people to perform audits
- Current auditing system is completely inadequate and does not promote quality

Roger Reedy - slide 24

10. Requirements for Physical Protection for Power Reactors

10.1 Robert Dube
Nuclear Regulatory Commission

In this portion of the workshop, we are going to address current safeguards requirements that might be marginal to safety. The staff's efforts in this area began about a year ago, following two major rulemakings related to safeguards.

The first was a rule that required licensees to implement a fitness-for-duty program. That was published as an effective rule on June 7, 1989. The second rule, published April 25, 1989, required an access authorization program that meets uniform standards.

Shortly after publication of the access authorization rule, the staff began an assessment of all its safeguards requirements related to protection against an insider. This effort was formalized in September 1991, when the Commission asked the staff to reexamine safeguards requirements to determine whether they might impair the ability of a licensee to safely operate the plant and to consider whether all of these safeguards requirements remained appropriate in light of the more recent rulemakings.

In June 1992, when the staff was nearing completion of its reexamination, NUMARC submitted a report of its reexamination in the same area and proposed what NUMARC identified as an alternative protective strategy.

The staff considered NUMARC's report and, on August 4, 1992, submitted SECY 92-272 to the Commission. The staff found that present safeguards requirements do not adversely affect plant safety. However, the staff identified a number of requirements that appeared to be only marginally effective and made a total of nine recommendations to the Commission.

In a memorandum dated November 5, 1992, the Commission directed the staff to reconsider the details of SECY 92-272 and to work with NUMARC to fully understand the goals of NUMARC's proposed alternative protective strategy and explore additional alternatives.

The staff held public meetings with NUMARC on November 20, 1992, and January 22, 1993. The International Union, United Plant Guard Workers of America attended the January meeting. In addition, a public meeting on the NRC's design basis threat for protection against sabotage will be held on May 10 this year at the Crowne Plaza Hotel in Rockville.

10.2 Garland P. Shreves
International Union, United Plant Workers of America

Good afternoon. I wish to thank the NRC staff for giving me the opportunity to represent my organization here today and to talk about issues related to security and the recommendations being put forth by NUMARC and other organizations.

There has been a lot of conversation about why my organization is here. There are several reasons. I understand there are approximately 44 utilities represented here today. Many of our members are employed at your facilities. We do not wish to leave you with the impression that we are not sensitive to the need to control costs and improve efficiency at the facilities; merely, we feel that strong security measures need to be in place to protect the facilities.

The UPGWA offers the following viewpoints in an effort to challenge the recommendations and assertions put forth by NUMARC.

Fitness-for-duty programs: These programs can enhance a strong security program but cannot take the place of good, sound physical measures, such as alarming and locking vital area doors, barriers, and well-trained security forces able to repel saboteurs. Fitness-for-duty programs help detect potential drug abuse by workers, but do not stop employees from becoming addicted to or abusing drugs in between testing periods, which would affect safe operations. For this reason, strong security measures for vital areas must remain in place to protect the public health and safety.

Continual behavioral observation programs: These programs can enhance a strong security program, but do little to protect vital area equipment if workers' subtle behavioral changes are not detected by coworkers. This type of program raises workers' awareness and vigilance of behavior that could be threatening, but only if the behavior is noticed. Subtle personality changes may go undetected. For this reason, the present security requirements should remain in place to provide the highest security possible for vital areas.

Even members of the medical community find it difficult to diagnose a person's mental health correctly. It is absurd to redirect security measures in this area and reduce security measures by having plant workers with little training attempt to diagnose subtle personality changes.

Security requirements for vital areas: NUMARC has suggested that door alarm assessment offers little or no security benefit. However, a door alarm offers awareness that a possible saboteur has gained access to a vital area. The annunciation of such an alarm allows the security force to react to the possible threat; a member of the security force can assess the alarming door and inspect the area and security equipment for signs of tampering. This is the only way to ensure that unauthorized access has not occurred or that acts of sabotage are not in progress.

Locked vital area doors and card-key systems do offer a high degree of security, contrary to NUMARC's assertion that they do not.

On that subject, I'd like to bring up the recent security incident at Three Mile Island. I don't really wish to pick on them, because they did a lot of things correctly. We haven't focused on or heard in the media about the things they did correctly, but they did do a lot of good things. One thing they did correctly was to lock the security vital area doors. There was a downside to that, since only one operator had access to the vital areas.

I think the answer to dealing with that problem in the future would be to issue keys to operators, as they do at some facilities, rather than eliminating the locking vital area door procedure that we have in place at this time. Locked vital area doors offer an inexpensive form of security compared with posting a security officer at the door.

Deleting requirements for locked vital area doors and their card-key systems would degrade security effectiveness. This system is very beneficial in deterring an individual from within from easily gaining access to areas he or she is not authorized to access. Simply put, deleting such requirements invites potential sabotage.

I would like to make the following recommendations:

1. Alarm assessment, vital area doors that lock, and the card-key systems should remain a security measure and a requirement for security effectiveness.

2. The present system of granting vital area access to workers should be modified to restrict access when it is not necessary for work purposes.

On the subject of posting a security guard at containment entrances: Controlling access of personnel and equipment into the containment is a security function. Security guards ensure that individuals have the proper access level to gain access. Security guards also ensure that materials are work-related and challenge anyone with materials that are questionable. This area is a big topic of discussion. We think the measure currently in place is important.

I would like to make the following recommendations:

1. At a minimum, continue with the present requirement to have a guard or watchperson at containment entrances to control access and materials.

2. Evaluate the upgrading of security measures, requiring security members to be armed while guarding containment entrances. This would allow security guards to take immediate action, including deadly force if necessary, to protect the public from potential radioactive exposure should an attempt be made by individuals to gain unauthorized access for the purpose of committing an act of sabotage.

The Federal Register dated January 27, 1993, stated, on behalf of the NRC, "The main aim of a performance-based regulatory approach is to allow licensees flexibility to use cost-effective methods for implementation of the objectives."

While cost containment is a relevant factor in any performance-based operation, it must not become controlling. It must not reduce the fundamental purpose of security to prevent the release of radioactive material. Security is not marginal to safety, but rather essential to protecting our nation's nuclear power reactors.

This issue deals primarily with the insider threat. However, in reviewing the NUMARC recommendations, I feel that acceptance of their proposals would also reduce security effectiveness in the area of an outsider threat—in the event of an outsider gaining access to the facility.

10.3 Bob Whitsel
NUMARC

Industry Security Activities and Position on Security Issues

Good afternoon. I want to explain exactly how NUMARC and our industry working group arrived at the recommendations we presented to the NRC in June 1992. We have had discussions with the Office of Nuclear Reactor Regulation on these issues before.

As previously noted, cost containment is a relevant factor in any performance-based operation. It is our intention that none of our recommendations does anything to reduce the fundamental purpose of security in preventing the release of radioactive materials. In no way do we want to degrade the effectiveness of the security systems that we have.

The NUMARC security working group currently in operation was formed in 1990. It has been in place almost 3 full years. It's composed of utility people from plants in all five of the NRC's regions, and includes executives, middle-level managers, and security specialists. The chairman of the working group is Bart Withers, who is the President and Chief Executive Officer of the Wolf Creek Nuclear Operating Corporation.

When the working group got together and gathered information from various sources throughout the industry, we settled on a number of issues for which we have developed recommendations.

Industry Security Activities

- Security Working Group:
  - Formation
  - Issues
  - Composition
- Alternate Protective Strategy (06/24/92)
- Re-examination of Nuclear Power Plant Security Requirements Associated with the Internal Threat (SECY-92-472, 08/04/92)
- Response to request for comments on reporting requirements (09/30/92)
- Letter recommending an alternate method for determining Safeguards Information (10/02/92)
- Letter to Chairman Selin (12/21/92)

Bob Whitesel - slide 1

These areas were vital area security; the re-search of an armed on-duty security officer; escorts for vehicles driven by people with unescorted access authorization; the watch people who are stationed at the containment entrance to control the flow of traffic in and out of the containment during outages; the 1-hour reporting requirements in Regulatory Guide 5.66 (this was in the days before we had Generic Letter 91-03, which solved quite a few of those problems); the generation of safeguards event logs and their quarterly submission; the security requirements for dry cask storage of spent fuel; safeguards controlled information; the enforcement of security violations; and the issue of having a separate SALP for security.

We put a lot of this together, at least as it related to four of those issues that deal with the insider threat—vital area door locks and alarms, re-searching of guards, vehicle escorts, and watch people in containment—and generated a document that we called the Alternative Protective Strategy. We submitted that document to the NRC last June. The thrust of that document is that, in the 15 years since we have had requirements in place to protect against the insider as well as the

outsider threat, our work force has matured and grown in trustworthiness.

We can point to two things that promoted this growth—the fitness-for-duty program and the access authorization rule. Industry guidance on procedures for generating unescorted access authorization to plant workers preceded this rule. The operation of those programs, as well as team building and other activities that promoted a much more cohesive and single-purpose work force in the plant, provided a much greater assurance that the insider threat was very low—so low that many of the measures in place to protect against the threat were getting us nowhere and costing us a great deal.

At the same time, the NRC staff was working on a similar evaluation of the effectiveness of certain insider protective measures. Those included the four issues mentioned before and a couple of others.

As you read through SECY 92-272, submitted to the Commission by the staff on August 4, 1992, you'll note that the staff agreed with the marginal effectiveness of these four provisions that we have been pushing in respect to protection against the insider, but the staff did not recommend any changes to the regulations. That took care of four of the issues.

In response to a request from the Commission to comment about the myriad reporting requirements to which the industry responds, we generated one of the attachments to a long letter that went back to the Commission on September 30, 1992, suggesting changes to the way safeguards events are logged and reported, and additional changes to the 1-hour reports. In early October, we submitted to the staff a document recommending an alternate method for determining what constitutes safeguards information and what does not. In various interactions and discussions with the staff, we understand that NRR has generally concurred that the categorization guidelines for safeguards information need to be tightened.

The industry sent a letter to the NRC just before Christmas last year discussing the industry-wide initiative aimed at gaining or regaining competitiveness for this industry. Security issues, the ones I have just talked about, were discussed in an attachment to that letter. In addition, we opened the subject of the design basis threat, which will be discussed at the public meeting on May 10.

Let me close with one point. At least one speaker yesterday made reference to the fact that implementation of our regulations is a larger problem than the regulations themselves. You may recall Frank Gillespie's comments yesterday morning about the difference that his task force has observed between commitments that plants make with respect to security and what the security plans reflect, and how the difference between those two has been confused.

10CFR73.55(h) addresses the number of armed responders that are required per shift to protect the plant against the design basis threat. Frank Gillespie referred to 13, and you can obtain that number by looking at the upper limits of the ranges in the regulations. Many plants have more than 13 armed responders per shift, and some have fewer.

Now, a number of sites are working to reduce their staffing levels to levels dictated more by regulations than historical commitments. That's a good example of where the implementation of the regulations, for whatever reason—the blame can easily be shared by all of us that have had anything to do with it—has generated some of the unnecessary costs that we are bearing, even though what we have done is far in excess of what is required.

10.4 Jerry Sims
Southern Nuclear Operating Company

Industry Security Activities and Position on Security Issues

What I would like to do is go through our rationale for presenting the issues that we chose to present—issues that we felt were marginal and therefore needed to be examined.

Some of you in the audience don't deal with security that much. Let me remind you that, just as you have design basis accidents, in the security area we have what's called a design basis threat.

We base all of our security measures at nuclear facilities on that design basis threat. That

threat is made up of two elements: an insider threat and an external threat, which is a violent attack from outside by several individuals. (This is a simplified definition.) We have been designing against that threat now for many, many years.

The second thing we're protecting against is radiological sabotage, which is an event that creates damage such that uncontrolled radioactivity in excess of the limits established in Part 100 would be released.

You need to keep those two benchmarks in mind whenever you talk about security at our nuclear facilities, because they are what constrains us; they are the basis of our thought processes. We have to think along those lines.

The first issue, which has already been mentioned, is that of "bilayered door" locks and alarms. We recommend removing bilayered doors; as barriers that are currently locked and alarmed, from the physical security plans. Our rationale is that the barriers are there. Now, let me back up one step.

Because those barriers are there now, we have to maintain those locks. We have to maintain those alarms. We have to respond every time the alarm goes off, whether it's a real alarm—which is very, very rare—or an inconsequential alarm. Examples of inconsequential alarms include cases where someone leaves the door open longer than allowed, tries to card-key into an area for which his or her card-key is not authorized, or props something in the door so he or she can get a tool cart out. We have to respond to all of those alarms.

We also have to patrol those doors. We have to rotate the core locks on those doors periodically. Because those doors and barriers are there, it creates a considerable drain on our resources—in terms of people and maintenance—throughout the plant.

If we back up once again, we ask why the door is there. What are the door and alarm really doing for you? In terms of the insider aspect of the design basis threat, we feel the door does nothing.

Numerous protective layers have evolved and are in effect now—the access authorization rule, the fitness-for-duty rule, the practice of conducting criminal history searches and fingerprinting for all potential employees, and the psychological testing and continual behavioral observation we conduct. We are confident that these are effective means for assessing whether you have an insider.

Some people feel that the necessity of going through a locked and alarmed door will be a deterrent. We feel a determined insider will already have a key-card and will already have access. The fact that there is a locked door will not be a real deterrent if the insider can go through that door anytime he or she wants to or has a need to.

If the door isn't there for an insider, why would it be there? You have to look at the external threat.

In all the drills and scenarios we have conducted at our plants, we have found that it's much more effective to concentrate your resources on the external threat as it comes at you and then deploy and interdict based on the strategy that you have developed and the route the adversary has taken. Our plants are naturally designed with choke points, and we know the layout of our plants better than any adversary does. We found that it's a lot easier for our security personnel to deploy themselves where they can be concealed and protected and yet defend the plant against access to vital equipment. In addition, we have operations people who are very highly trained and tuned into what's going on in the plant; they would know in an instant if vital equipment were being degraded in any way.

The screening aspect is the same for protected areas and vital areas. The screening criteria used to determine whether someone can go into a protected area are the same as the screening criteria used to determine access to vital areas. In all of our nuclear plants, almost everyone who has access to protected areas also has access to vital areas. There is really no distinction between layers or levels of access.

In summary, the vital area doors, locks, and alarms are of no benefit against the insider threat. They are of marginal benefit against the external threat. We have proven that, and we feel confident that's a good reason to remove those requirements. That does not mean we would not use vital area doors, locks, and alarms for administrative controls. What we are saying is we would remove the regulatory requirements—which dictate that

we compensate for that door within 10 minutes—from the physical security plan

Currently, if the lock or the alarm goes bad, we have to post an armed guard within 10 minutes. We can have a piece of safety-related equipment out for 3 days, but we cannot have that door lock broken for longer than 10 minutes without doing something about it.

The second issue is the requirement for re-searching armed guards. Whenever one of our armed security officers leaves the protected area for duties that he or she is assigned to perform outside the protected area, he or she must be re-searched upon reentry according to the current regulation.

We feel that's not a good requirement. Our security officers are fully screened to begin with. They are very highly trained professionals. They are trustworthy. They have full unescorted access. They already have firearms. It doesn't seem logical to have them remove their firearms so they can be searched to see whether they have firearms, and then hand them back the firearms.

Then there is the area of the explosives search. Security officers are the people usually tasked with searching vehicles and patting down individuals for explosives. There is some marginal benefit in having a security officer go through an explosives search, but again, it's very demeaning to that officer.

The regulation currently allows local law enforcement and Federal enforcement agencies to come on site without being searched either for firearms or explosives. The regulation exempts them from the search, which again sort of flies in the face of our security people. Such an exemption says to the security personnel that we believe a uniformed police officer is more trustworthy than they are. Yet the security personnel are on the payroll of the utility and have been through the screening process and testing to keep their jobs. It's quite an effort for these people to stay qualified. So this requirement is very demeaning to them, and we feel it should be removed from the regulation.

The third issue is the requirement, in protected areas, for an escort in vehicles driven by persons with unescorted access authorization. We feel the regulation needs to change. If the driver has unescorted access authorization, once the vehicle is searched there is no need to have a second person sitting in the cab with the driver. As far as we're concerned, the escort adds no value to security. For the driver to have unescorted access authorization, he or she has gone through the screening process and has proven that he or she is trustworthy and reliable. We don't feel the escort adds any degree of security.

The fourth issue is the requirement for a watchperson at the containment entrance. Currently, the regulation requires a security watchperson at the containment entrance anytime the containment is open for frequent access. The watch person's primary function is to observe the introduction of materials or contraband into the containment.

We feel the watchperson is redundant. Everyone is searched for contraband before her or she ever gets into the protected area. I know of no personnel portal to a vital area that is not already inside a vital area itself. Many equipment hatches are open through the protected area, but to get to most personnel accesses to the containment, you have to go through a protected area and a vital area.

There is no search conducted by the watchperson. He or she is strictly there to observe what is going in and what is coming out. The watchperson really does not have the knowledge necessary to make an assessment of whether or not the material going in is acceptable. He or she does not know the type of work being conducted nor the tools or materials required to support that work. So, the watchperson really cannot make a meaningful evaluation of whether or not the material is acceptable.

We feel the best security measure relative to containment is the close-out of the containment after major work is done and the subsequent valve line-ups and walk-downs performed by the maintenance people as they clean up after the work, and later by the operations people as they line up their systems and get ready for a fueling event and for heat-up.

Another issue is the 1-hour reporting requirement. Currently, the regulation requires us to pick up the "red phone" and notify the NRC Operations Center of a possible security event within 1 hour of occurrences that are not, we feel, worthy of a

red phone call. Most of the time, you don't have enough details to tell the NRC Ops Center what's really going on within 1 hour; you're still in the evaluation process.

We recommend narrowing the requirement to apply only when a real security event has been confirmed. We feel the NRC needs to know about confirmed security events, both from the standpoint of responding to the event and to the public. If we focus on real events, this reporting requirement will do what it's really intended to do. Generic Letter 91-03 went a long way in this direction; there are just a few things that we would like to do to make it a little more meaningful.

The next issue deals with the safeguards event logs that we keep on site and must submit to the NRC quarterly. We would like to delete the requirement for this submission for nuclear power reactors. We feel it's not adding any value to security.

We would like to do the trending on site—continue to collect the data; have the resident inspectors and the local regional inspectors, as they come in, look at the data; see what the trends are; determine the corrective actions; and determine whether you're ignoring problems or actually finding and correcting problems.

Data are more easily trended on a plant basis than on an industry basis. You cannot really draw any conclusions from data that are republished by the NRC because the data are too broad-based and too generic; you really cannot draw anything specific.

Industry Positions on Security Issues

- Vital Area door locks and alarms
- Re-search of armed security guard
- Escort of vehicles driven by person with unescorted access authorization
- Watchman at containment entrance
- One hour reporting requirements
- Safeguards events logs/submission
- Design Basis Threat re-evaluation

Jerry Sims and Bob Whitesel - slide 2

The last issue is a reevaluation of the design basis threat, which will be discussed in depth on May 10. If you are interested in that, attend that public meeting.

10.5 Open Forum Discussion Summary

Jim Riccio
Public Citizen's Critical Mass Energy Project:

The Three Mile Island intruder incident demonstrates why locked doors and barriers at nuclear reactors should not be reduced. Also, a 1990 Rand Corporation study done for DOE on 62 insider crimes found that a high percentage (perhaps 41%) of these insider crimes were committed by guards. I think it would be unwise to remove security requirements, such as the re-search of guards for contraband, or to reduce the drug testing because it has been so successful.

Bob Whitsel
NUMARC:

Fitness for duty programs have been extremely successful. However, the existing programs go beyond what is necessary to achieve their effect. The intensity of the program can be reduced without reducing its effects.

Lou Scohy
UPGWA:

I agree with NUMARC on the elimination of re-searching armed guards, but disagree with the other security reductions that NUMARC recommends. If this is an issue of costs then the plants already have control of costs when they draw up and implement security plans. Most utilities exceed NRC requirements and could save costs there without the NUMARC proposals. The recent Three Mile Island and World Trade Center incidents indicate that it is not a good time to reduce security requirements.

Judith Johnsrud
Environmental Coalition on Nuclear Power:

The NRC should give consideration to the security problems that could arise when there are competitor security firms operating at the

same site, for example, when one unit is operating and one is under construction.

James Knubel
GPU Nuclear:

The NRC has lost perspective on security issues; workers feel that security impedes work effectiveness. Excessive security, like locked vital areas requiring a lot of keys, may prevent access to equipment by operators, thus reducing the level of plant safety. Security, applied out of context, has resulted in some conditions that are adverse to safety.

Skip Copp
Duke Power:

With regard to Mr. Scohy's comment that cost control is within the power of the licensees, security plans are specific and the NRC regulation of the plan is detailed and prescriptive, and mandates costs beyond the licensees' control.

11. Summary/Procedures for Continuing Focus and Interactions for Ongoing Program

Steve Floyd
Nuclear Management and Resources Council

I'd like to thank the NRC for this conference. It's apparent that this forum has stimulated a very good exchange of information. I think it's this type of conference that's necessary to effect the culture change that Chairman Selin referred to in his opening remarks, both within the NRC and the industry, and effect a change in the regulatory process in this country.

With that, I'd just like to focus on a couple of key points. As we all know, the utilities are responsible for the safety and management of their resources. However, we sometimes lose sight of, the fact that no one knows more about our plants than we in the industry do. It is our responsibility to propose to the NRC technically sound, cost-effective solutions to the problems we encounter.

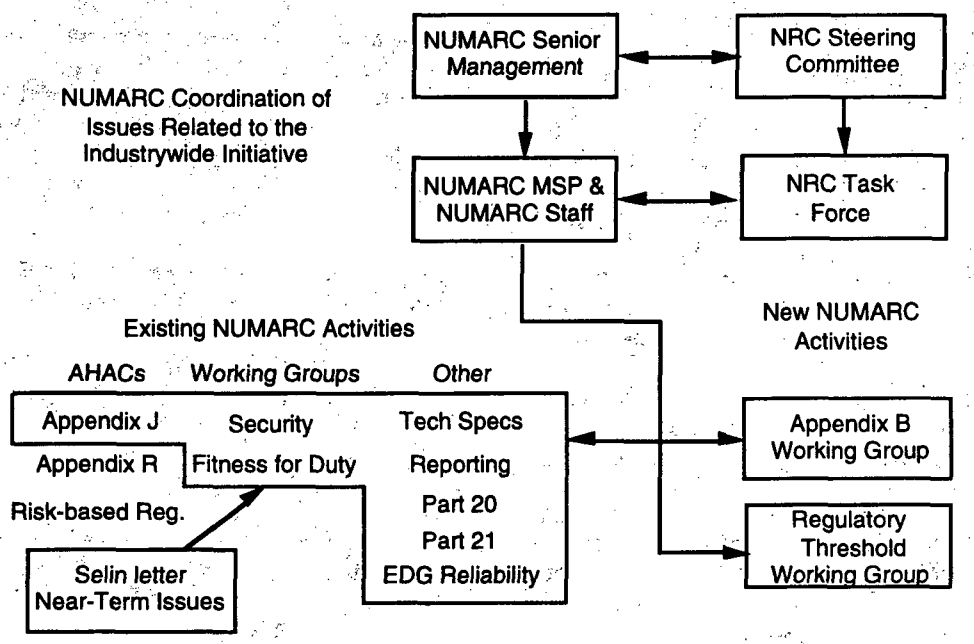
Quite often, we look to the NRC to solve some of our problems merely by pointing them out, yet we are in the best position to understand how to go about the process—and in the ways we think best.

In the 1980s, nuclear plant personnel focused on safety performance. If you look at the trends and improvements in plant safety performance that occurred during that decade, they are very dramatic. The results of that concerted, focused effort were substantial. Now we need to focus on ways to more effectively and efficiently maintain this high level of safety. This is the focus of the initiative that the industry is getting ready to embark on. (See Figure 11.1.1)

When it comes to solving problems, the best data reside within the industry, and these data are better than ever before. So are the tools we have to analyze both the cost and safety impacts of proposed resolutions. These improved tools are the benefits reaped from the PRA studies we have all done.

The NRC does not have plant performance data nearly to the extent that we do. We have

Figure 11.1.1



got to start providing these data to them in a more concerted, more consolidated, and more complete fashion, so that the technical documentation to support the resolutions we seek is readily available.

NUMARC will be calling on the utility industry to provide cost and safety data, and we encourage you to respond as quickly and as thoroughly as you can when a request is received, so that we can keep any open issue moving through the resolution process established with the NRC.

The word "compliance" has been used frequently during this workshop. The common theme I have heard voiced over the past 2 days is that far more reliance is placed on documentation to demonstrate compliance than is placed on performance. That is something we all need to be sensitive to as we consider new regulatory formulations. The worst thing we could do would be to just replace one highly prescriptive, compliance-based process with another one as we try to fix some of the things we think need fixing.

I'd like to propose that the industry and the NRC work together to identify what we need to do to expedite the issue-resolution schedule, starting with an agreement on what to designate as the highest priority issue. We need to specify some concrete steps we can take, identify some specific information needs, and then see if we can work together as an industry to provide that information so that we can improve on the current schedule.

I'd like to see if we could get the highest-priority issue resolved—if not by the end of this year—then certainly by early 1994. The current target, which is the middle of 1995, is probably more time than we need. I think we can do better than that if we focus. To this end, NUMARC would still like to hear from the utility industry and the public on what they believe are the most important issues we should focus on and in what order of priority.

In addition, some outstanding issues exist, none of which were addressed in the December 21st letter to the Commission, nor included in the issues identified during this workshop, which we nevertheless believe need resolution. Some of these issues may warrant a higher priority of attention than any of the issues we are planning to resolve now. We would like some comments on this.

Two industry workshops are planned to address the problem at least partially. NUMARC, INPO, and EPRI are sponsoring a workshop on June 24th-25th in Atlanta, which will be geared to those at the vice-president level and above in your companies.

The focus will be to look at two, key areas. One is cost-effectiveness in plant operations. The other is how to manage the regulatory interface, which occurs predominantly during the inspection activity. The workshop will also include a look at codes and standards interactions and what our responsibilities are in that area.

The second workshop will be held in July. I think the dates are the 26th and 27th. This workshop will be geared to licensing and compliance managers and their vice presidents who oversee those functional activities in each utility, The focus will be to look at how licensing and compliance managers can ensure that their regulatory interactions with the NRC encourage an approach to problem resolution that neither scants the safety significance of the issue at hand, nor commits resources that are disproportionate to the importance of that issue.

Alex Marion
Nuclear Management and Resources Council

Let me just elaborate on this with an example.

Post-accident sampling systems were addressed by the NRC last year when the agency published a Notice in the Federal Register on regulations marginal to safety. Yet post-accident sampling systems do not appear within the present scope of our considerations of requirements that might be marginal,

As I recall, the Federal Register Notice concluded that no safety benefit was obtained from such sampling systems in today's environment. However, the Notice also indicated that, because the utilities already had implemented the systems, there was no point in changing the regulation.

One of the factors that wasn't considered in reaching that conclusion, however, was the cost the utilities will incur to maintain these post-sampling systems. A regulatory change, based on the marginality to safety of these required

systems, may be something we pursue with the NRC in the next couple of years. For the moment, I am just proposing that NUMARC take a good, hard look at the situation and communicate our intentions to the NRC.

During the course of the workshop, there has been, as Steve indicated, a focus on compliance. If the industry is seen as avoiding accountability to the regulations, the perception is a false one. To counteract such impressions and to clarify our true positions, a number of you have spoken of communicating with the Nuclear Regulatory Commission with one, unified voice. This form of communication has been working very effectively since the inception of NUMARC.

NUMARC has worked with the NRC on a number of issues in public forums. Together we have approached these issues with the overarching directive to maintain levels of safety, but we have also dealt with the actual problems at hand and the practicalities of how to improve a given situation. As for implementation issues, we need to look at what occurs during inspection activities.

Most of the time, implementation of the NRC regulations and requirements is carried out during inspections and audits of sites. Here is where I believe we are losing the war. It is during inspections and audits that commitments are made by individual utility personnel to individual NRC inspectors. If you consider the number of inspections and NRC visits that occur over an operating cycle, multiply that number across the industry, and factor in the resources that must be marshaled to follow through on these commitments, you may conclude that we need to find new ways to respond to queries from the inspectors that are effective, but that require fewer resources, especially in areas where we agree to take actions that go above and beyond meeting the intent of a regulation.

Our recommendations for improvements in some of the regulations, and/or in the regulatory process will become available in the NRC public document room as we submit them. More importantly, our meetings with the NRC staff to discuss our recommendations will be held in a public forum, which is extremely important to creating an atmosphere of public trust and credibility.

Public perception is bound to be affected by the terminology we use. Just consider the name of this workshop, which is "Program for Elimination of Requirements Marginal to Safety." Are we talking about compromising safety? Some people might get the impression that we are. The NRC ought to opt for different terminology that states our intentions in a legitimately positive light. Unfortunately, the perception that gets picked up by the public and the media all too often is negative.

Chairman Selin made a point yesterday morning when he said that the major reason for seeking to remove inefficient regulations is safety. I could not agree more. That is our primary motivation here. By removing inefficient regulations, he added, we will free up resources that can be shifted to more productive safety uses. That mission has been made clear over the course of this workshop, and is something both we in the industry and in the NRC need to reinforce.

Consider how the public might perceive other terms we use, like "win-win option." How will John Q. Public interpret that? Does it mean we negotiate a solution to a safety concern?

No, of course we don't negotiate on safety. What we really do is reach a consensus that a given activity will not compromise current levels of safety. As we progress in the ways we resolve particular issues, especially as we use probabilistic safety assessment methodologies more and more, we can demonstrate an enhancement or an improvement in plant safety and performance that also is cost-effective. That ability to demonstrate a win-win situation is very important. And it is important to reinforce such points in the public arena.

Within NUMARC, we've begun to avoid using the word "risk" during our deliberations on the risk-based approach to regulations—again, because of the public perception associated with that word. In the future, we hope to hear about probabilistic safety assessment far more often.

12. Recommendations

The recommendations captured in this summary are excerpted from the presentations and discussions of the workshop participants.

12.1 Summary of Recommendations

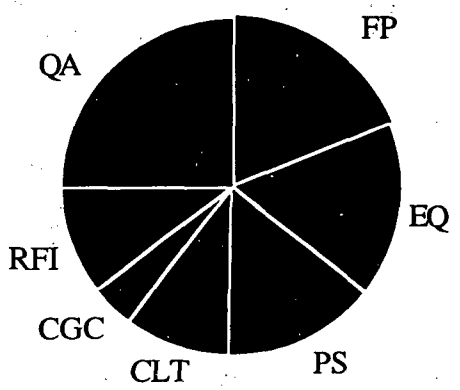
Comments were offered by thirty-eight different groups, including industry and utility groups, licensees (utilities), government agencies, public interest groups, organized labor, and academia. (Some of the comments numbered below contain more than one recommendation. For the purposes of this tabulation, each recommendation is counted, and the endorsement or disagreement of one organization's comment by a representative of another organization was counted as well.) About two-thirds of the comments received dealt with specific regulatory requirements (see Figure 12.1.1). The remaining comments were of a more general nature; most of these dealt with the issue of performance-based regulation and the application of probabilistic methods.

Many specific changes to regulation were proposed without significant disagreement. This was the case in the areas of containment leak testing, combustible gas control, equipment qualification, and the reporting requirements of 10CFR50.54(f).

Comments were of several types. Figure 12.1.2 shows the distribution of comments categorized as follows: proposed changes to a specific piece of regulatory language (whether regulation, guidance, or policy); comments on the implementation of a regulation, rather than its text; suggested methods or criteria of regulatory decision making; proposals for the program for the elimination of marginal safety requirements itself; and finally, over-arching recommendations on the direction of regulation.

Figure 12.1.1

Comments on Specific Regulations

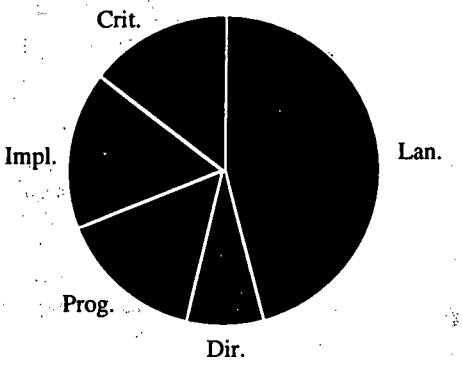


Key

QA	Quality Assurance	34
FP	Fire Protection	26
EQ	Environmental Qualification	34
PS	Physical Security	20
CLT	Containment Leak Testing	13
CGC	Combustible Gas Control	6
RFI	Requests for Information	14

Figure 12.1.2

Comment Types



Key

Crit	Criteria	28
Lan.	Language	88
Dir.	Direction	15
Prog.	EMSR Program	29
Impl.	Implementation	31

12.2 Recommendations on the program to Eliminate Marginal Safety Requirements

Some recommendations of a programmatic nature were offered

1. Steve Floyd

NUMARC

Focus industry and NRC resources first on three areas of common interest: containment leakage testing requirements; requirements for physical protection for power reactors; and the regulatory threshold for a risk- and performance-based approach.

2. Steve Floyd

NUMARC

Establish a senior team or senior NRC management review board to ensure that the issues identified during this conference and through other endeavors are pursued to a complete resolution in a timely manner.

3. John MacGregor

Winston and Strawn/NUBARG

Change 10CFR50.109, the backfitting rule, to provide for a periodic review of regulations.

4. Roger Reedy

Reedy Associates

Focus on changing the manner of implementing the regulations, not necessarily the language of the regulations themselves.

5. Dave Modeen

NUMARC

Agrees with Roger Reedy that the EMSR Program should focus on changing the manner of implementing the regulations, not necessarily the language of the regulations themselves.

6. Don Edwards

Yankee Atomic

Move away from the general direction at the workshop to very tangible steps, e.g., establish a task manager, a milestone schedule, a reporting system, and a method of interacting to track progress.

7. Martin Bowling

Virginia Power

Coordinate the interpretation of regulations with the inspection and enforcement branch.

8. Martin Bowling
Virginia Power

Use a regulatory process that integrates deterministic, risk-based, and performance-based regulation and allows for case-specific evaluation, with a goal of protecting the health and safety of the public and at the same time minimizing the cost to the licensee.

9. John Hosmer
Florida Power and Light

Agrees with Martin Bowling that the regulatory process should integrate deterministic, risk-based, and performance-based regulation and allow for case-specific evaluation, with a goal of protecting the health and safety of the public and at the same time minimizing the cost to the licensee.

10. Ralph Widell
Florida Power Corporation

Review the regulatory process to see if the framework is in place to solve problems rather than develop new regulations and prescriptive requirements.

11. Steve Floyd
NUMARC

With industry, work to beat the schedule proposed by James Taylor in the first session, i.e., try to resolve issues at least by early 1994, not sometime in 1995.

12. Joe Bell
American Electric Power

Industry should invite public interest groups to meetings to discuss proposed regulatory changes.

13. Alex Marion
NUMARC

NUMARC will revisit the need to retain post-accident sampling systems to determine if there would be a benefit in eliminating the requirement for PASS because of the resulting savings in operating and maintenance costs for the system.

14. Don Edwards
Yankee Atomic

Agrees with Alex Marion that the need to retain post-accident sampling systems should be reviewed to determine if there would be a benefit in eliminating the requirement for PASS because of the resulting savings in operating and maintenance costs for the system.

Performance-Based Regulation

Comments from industry and academia generally encouraged the NRC to move in the direction of performance-based regulation, and away from the current compliance-based regime. A performance-based approach was specifically recommended for application to quality assurance requirements. Several of the other recommendations in the quality assurance area lent support to this position.

One state agency cautioned that performance-based regulation made sense only for reactors of standard design that may be the "next generation" of nuclear plants (requisite controls over design and construction can be achieved). This comment was endorsed by one of the public interest groups.

15. Dan Stenger
Winston and Strawn

When revising existing regulations to make them performance-based, minimize the impact on licensees and their current programs by:

a. Adopting the new regulation as an alternative to the existing regulation for voluntary implementation by licensees (eliminates the backfit rule); or

b. Adopting the regulation as a new one, but protecting or grandfathering existing licensee programs that meet the requirements of the existing regulation; or

c. Putting the details of the existing regulation into a regulatory guide as an acceptable way to meet the new performance-based regulation.

16. Fred Mowrer
University of Maryland

Requirements in all areas should be performance-based. Where there is more uncertainty, the safety factor with respect to performance should be larger.

17. Michael Golay
MIT

Development of performance-based regulations should be expedited.

18. Dave Modeen
NUMARC

Develop quantitative indices and tools that can assist in defining acceptable plant performance. Quantitative indices provide the type of measure the public and the NRC is concerned about in determining "how safe is safe enough."

19. Michael Golay
MIT

Establish the models, analytical approaches, and databases that the NRC will accept for a performance-based regulatory approach. The applicant should remain free to propose an alternative approach.

20. Tony Pietrangelo
NUMARC

Impose two conditions on the process of elimination of marginal safety requirements:
a. Maintain or improve safety through the blend of prescriptive and performance-based regulations; and
b. Use the results to improve allocation of resources to those things most important to safety instead of treating everything equally.

21. Paul Smith
Readiness Operation

Agrees with Tony Pietrangelo that it is appropriate to constrain changes to regulation to maintain or improve safety through the blend of prescriptive and performance-based regulations.

22. Neill Howey
Illinois Department of Nuclear Safety

Use performance-based regulation for the next generation of (standard design) plants (not currently operating plants) because necessary conditions can be ensured prior to licensing.

23. Judith Johnsrud
Environmental Coalition on Nuclear Power

Agrees with Neill Howey that the use of performance-based regulation should be deferred until the next generation of plants, not used for those currently in operation.

24. Michael Golay
MIT

In the early stages of evolving a performance-based regulatory system, focus resources on Level-1 PRAs—where uncertainties are manageably small and there is direct applicability.

25. Michael Golay
MIT

Establish methods of evaluating performance success and determine what happens if criteria are not met.

26. Michael Golay
MIT

Use the help of an external board similar to the ACRS, or the ACRS itself, to provide a continuing critique during the process of developing performance-based regulation.

27. Morris Schreim
NUMARC

Make the regulations performance-based and the associated guidance documents prescriptive so that only the guidance documents—not the regulations—will need to be changed in the future as more information is gained.

28. Judith Johnsrud
Environmental Coalition on Nuclear Power

Conservatism that may far exceed performance-based regulation is in the public interest, even if it initially costs more to the industry and the NRC.

Implementation of Regulatory Requirements

Thirty-seven of the comments received dealt with implementation issues, that is, the way the regulations are interpreted, imposed, administered, inspected, and enforced (as opposed to the literal meaning of the regulatory language). Six of the comments placed in this category called for changes in technical specifications. (These recommendations are grouped with the regulatory issues to which they pertain.)

Probabilistic Safety Assessments

Many comments were received on the subject of applying probabilistic methods to regulatory issues. These reflected the broadest possible spectrum of opinion, ranging from those who were entirely skeptical of risk assessment technology, to those who advised that PRA insights be used only to decide which deterministic regulations are most important, to those prepared to advance very specific and detailed plans for using probabilistic methods in regulation. Suggested applications for probabilistic methods included quality assurance programs, fire protection, and the direction of the program to eliminate marginal safety requirements itself.

29. John MacGregor
Winston and Strawn/NUBARG
Use risk-based or PRA data to identify areas of regulation that might not reach a threshold associated with a safety goal.

30. John Hosmer
Florida Power and Light
Use PRA as an additional tool to create a win/win situation for the public, the NRC, and the utility, not to throw out everything prescriptive and deterministic.

31. Paul Smith
Readiness Operation
Agrees with John Hosmer that PRA should be used as a tool to improve regulation, not to eliminate prescriptive and deterministic regulations that work.

32. Martin Bowling
Virginia Power
Define "safety-related" based on risk analyses.

33. Judith Johnsrud
Environmental Coalition on Nuclear Power
Do not evaluate performance on the basis of probabilities.

34. Neill Howey
Illinois Department of Nuclear Safety
Use the insights derived from PRAs and plant operations in regulatory approaches. The PRAs must be consistently performed, rigorously scrutinized, and continually updated to be valid. Data on failures must be correctly recorded and used.

35. Michael Golay
MIT
Evolve a general approach to formulating deterministic performance goals and success criteria based on PRA, but do not use PRA directly.

36. Charlie Bergeron
Grove Engineering
Use the risk-based PRA decision process to set criteria in a performance-based atmosphere.

37. Joe Burton
Gulf States Utilities
Use PRA techniques as part of the regulatory reform program for Appendix R, Generic Letter 92-08 and Generic Letter 89-10, Appendix J, Appendix B, environmental qualification, plant security, and operator requalification training.

38. Jim Perry
Niagara Mohawk
Apply PRA and IPE techniques to guide the application of a graded QA program.

39. Hershel Specter
New York Power Authority
Use risk techniques to screen for safety-significant components, then use additional risk techniques to determine whether the QA process for those important components is safety significant.

40. Jim Riccio
Public Citizen
Explains that the public has reasons not to trust the NRC or utilities in using PRA, citing the example of Thermo-Lag: The NRC is considering lowering the requirements for Thermo-Lag or changing them to nonprescriptive requirements when the more restrictive standards are not even in place yet.

41. Judith Johnsrud
Environmental Coalition on Nuclear Power
Seriously consider the chain of :
a. Highly improbable events, and
b. Events that appear minor on the surface, but in particular circumstances can have unanticipated significance.

Containment Leakage Testing

Industry representatives presented a wealth of data on the cost and benefits of containment leak testing. A revision of Appendix J is already on the regulatory agenda, and one comment was to proceed with that effort. Several technical changes were proposed, for example, allowing a mass-point test of reduced duration, and the use of the minimum pathway leakage method. Small safety significance and significant cost savings were shown for the relaxation of testing requirements.

42. Lee Russell
Baltimore Gas and Electric

Change the Type A test interval to 10 years. New plants should have a periodic test within 3 to 4 years after start-up; if those tests are satisfactory, the interval would be 10 years. Failure of a 10-year test would result in a penalty and a different test interval based on the specifics of the failure.

43. Kevin Christian
Entergy Operations, Inc.

Require Type A tests once every 10 years, and base the text interval for Type B and Type C tests on the performance history of the piece of equipment. A proposed schedule for Type B and C testing is as follows:

a. Every 2 years for components that pass one test or failed the previous test;
b. Every 5 years for components that pass two tests, and
c. Every 10 years for components that pass three tests.

Test intervals should also be based on engineering judgment, component application, industry experience, system function, component size, and operation medium.

44. Steve Bethay
Southern Company

Agrees with the recommendations of Lee Russell and Kevin Christian for changes to containment leak testing requirements.

45. Mark Hutcheson
Duke Power

Two recommendations:

a. Proceed with the proposed Appendix J, and
b. Allow a mass point test of reduced duration.

46. Steve Bethay
Southern Co.

Make Appendix J a performance-based rule coupled with an ANSI standard, an industry guideline, and an implementation document.

47. Steve Bethay
Southern Co.

To calculate the total pathway leakage (as-found leakage rate), use the minimum pathway leakage method.

48. Steve Bethay
Southern Co.

Make surveillance intervals and grace periods in Appendix J consistent with technical specifications.

49. Steve Bethay
Southern Co.

Clarify the proposed rule (Appendix J) to say that a failure during the verification test due to a testing deficiency does not constitute a failure of the Type A test.

50. Steve Bethay
Southern Co.

Revise Appendix J to allow the deferral of a Type A test following a modification that results in the attachment of 1-inch diameter pipe to the containment. The Type A test can be deferred after local leak-rate testing and other nondestructive examination of the weld have been conducted.

51. Walt Smith
NUMARC

Supports the NRC objective of a performance-based approach to Appendix J testing and will cooperate with the NRC in this effort.

Fire Protection

In the area of fire protection, most of the commenters from the industry called for greater flexibility and some relaxation of specific, prescriptive requirements. Numerous commenters urged that any changes to Appendix R should leave licensees the option to comply with current rules. Several techniques of fire protection analysis were put forward as suitable for acceptance by the NRC. While it is possible for licensees to apply for exemption from a rule, and this option has been exercised frequently with respect to Appendix R, this is relatively burdensome for both licensees and regulators.

Fire protection was cited by one commenter as an issue contributing to public distrust of performance-based approaches in the regulatory process, because of the appearance that prescriptive requirements will be relaxed rather than ensuring that safety requirements are met.

52. Morris Schreim
NUMARC

Allow utilities to choose between two options for Appendix R:
a. Meeting the existing requirements of Appendix R, or
b. Meeting the requirements of a new performance-based rule that is accompanied by a guidance document explaining how to meet those requirements. (This could be used in whole or in part.) Amend 10CFR50.48 to explain how utilities choose among their options.

53. Doug Brandes
Duke Power

Make following revisions to Appendix R:
a. Reduce redundancy in regulatory guidance by combining GDC-3 and branch technical position ASPCB and CME-B;
b. Treat exposure fires and direct fires in the same way;
c. Refer to existing emergency operations plans and procedures for repairs rather than specifically stating requirements;
d. Clarify terminology re "alternative" and "dedicated" shutdown capability;
e. Include the option to predict design basis fires and consequences;
f. Make the requirements on fire brigade training more flexible to accommodate plant operations;
g. Revise and improve Sections J and L [specifics not identified]; and
h. Reevaluate requirements for emergency battery-powered lighting inspection (e.g., duration requirements).

54. Hank George
Synergy Consulting

Modify Appendix R as follows:
a. Allow the use of PRA to determine fire protection features;
b. Move present protection measures to a Regulatory Guide;
c. Endorse industry fire PRA methods in a Regulatory Guide;
d. Allow compliance with current Appendix R requirements as opposed to the PRA approach; and
e. Allow selective application of the alternate PRA approach.

55. Hank George
Synergy Consulting

Consider relaxation of other Appendix areas:
a. Disabling automatic features;
b. Transient combustible load calculations;
c. Loss of off-site power;
d. Three-hour fire barriers;
e. Allowance for operator actions; and
f. Emergency lighting.

56. Sheldon Trubatch
Winston and Strawn

Performance-based rules (specifically Appendix R) should contain:
a. Safety objectives derived from risk considerations (PRA), and
b. Inspectable and flexible acceptance criteria.
(This type of rule automatically eliminates regulations that are marginal to safety.)

57. Ken Dungan
Society of Fire Protection Engineers

Ensure that measures against which performance will be evaluated are stated clearly.

58. John MacGregor
Winston and Strawn

In the area of fire protection, consider keeping open the normal regulatory options for exemption requests, operability determinations, etc.

59. Doug Brandes
Duke Power

Fire dynamics techniques should be used to determine what types of fire barriers are needed in various parts of the plant.

60. Fred Mowrer
University of Maryland

Examine both compartment boundaries and ventilation in establishing performance criteria.

61. Paul Gunter
Nuclear Information Resource Service

Argues against the elimination of Appendix R requirement (specifically for Comanche Peak) and against moving from a prescriptive to a nonprescriptive approach for fire protection. Expresses concern about the possibility of utilities taking shortcuts.

Equipment Qualification

Specific suggestions in equipment qualification included the adoption of a graded approach, whereby the greatest rigor would be applied to those items most

significant to safety. The use of analysis should be allowed in addition to the extensive testing currently required. The methods developed by the Seismic Qualification Utility Group were recommended for application to an expanded range of technical issues.

Several commenters recommended reassessment of equipment qualification requirements and the quantification of factors relative to equipment function in a post-accident environment, including the appropriate source term, leak-before-break environments, and a more realistic analysis of the accident duration for which qualification is needed.

62. Phil Holzman
Star, Inc.

Modify qualification regulations and guidance to recognize and permit the level of qualification to depend on risk significance.

63. Phil Holzman
Star, Inc.

Focus the most rigorous qualification methods on risk-significant equipment in the most severe environments.

64. Phil Holzman
Star, Inc.

For certain classes of equipment, depending on the severity of the environment and the significance of the equipment, apply a graded, less onerous approach rather than a rigorous methodology.

65. Phil Holzman
Star, Inc.

Modify qualification regulations and guidance to:
a. Permit the optional use of revised source terms for environmental qualification in existing plants, and
b. Differentiate between design basis event and severe accident source terms; do not apply severe accident source terms to EQ.

66. Bob Tjernlund
Sargent and Lundy

The NRC staff should recognize that onerous qualification requirements degrade the availability of qualified equipment.

67. Jack Jirowsek
Niagara Mohawk

Agrees with Bob Tjernlund that the NRC staff should recognize onerous qualification requirements degrade the availability of qualified equipment..

68. Bob Tjernlund
Sargent and Lundy

Revise regulatory guidelines to encourage the use of engineering analysis based on lessons learned from more than 14 years of cumulative EQ research, testing, and operating experience. (This would allow licensees to take advantage of lessons learned to focus resources on new and better ways, materials, and products rather than simply confirming what is already known.) Encourage actions to use this experience along with the knowledge accumulated by other (nonnuclear) industries to do the following:
a. Quantify the factors that affect an item's ability to function under adverse (harsh) conditions;
b. Identify proven ways of addressing these factors;
c. Quantify how aging stressors (principally radiation and temperature) affect the properties of specific materials; and
d. Establish the limits of our knowledge base and use this information to minimize the EQ burden.

69. Charles Turk
Entergy Operations

Industry should revisit alternatives to addressing aging identified in 1980 and come back to the NRC with research results.

70. Steve Hunsader
Commonwealth Edison

Establish through guidance the maximum post-accident operating time for EQ (e.g., 14 to 30 days) based on actual contribution to risk.

71. Steve Hunsader
Commonwealth Edison

Clarify guidance to apply radiation thresholds based on component materials.

72. Steve Hunsader
Commonwealth Edison

Clarify guidance to reaffirm the regulatory definition of "harsh."

73. Hugh Gelston
Florida Power Corporation

Work with industry to develop guidance that explicitly recognizes licensee flexibility in identifying and adjusting EQ maintenance schedules, and establish a generally accepted maintenance grace period (e.g., 25 percent).

74. Bill Horin
Winston and Strawn

Explicitly confirm that licensees may take exception to Regulatory Guide 1.97 guidance concerning qualification.

75. Bill Horin
Winston and Strawn

Revise General Design Criterion 4 to extend the application of leak-before-break technology to the area of environmental qualification of equipment (i.e., reopen the issue).

76. Bill Horin
Winston and Strawn

Extend arbitrary intermediate break relief to non-MEB 3-1 plants (i.e., to B31.1 plants) in the area of environmental qualification.

77. Charles Turk
Entergy Operations

Treat EQ the same as all other design requirements.

78. Wade Larson
EPM

Questions whether the EQ regulation is even needed, at least in its current form.

79. Roger Huston
TVA

Industry and regulators must be willing to accept technical judgment, which means extrapolating from what has been firmly analyzed and tested, to control costs. One application for doing that may be seismic qualification of equipment.

80. Jack Jirowsek and Roger Huston
Niagara Mohawk and TVA

The use of SQUG methods should be expanded beyond USI A-46.

Physical Security

Many security requirements were cited by utility groups and licensees as marginal to safety. Representatives of the union of plant guards disagreed sharply on most of the specific recommendations of the alternate protective strategy outlined by NUMARC. There was agreement between these commenters that armed guards need not be repeatedly searched on reentry into the protected area. Public interest group comments were generally in favor of more stringent security measures. For example, the low incidence of drug abuse detected by screening programs was cited by licensees as justification for reducing the drug-testing rates. A public interest group cited the same data as an example of the success of high testing rates and reason for their continuation.

81. Jim Knubel
GPU

Requirements for alarm assessment, vital area doors that lock, and card-key systems should be deleted.

82. Garland Shreves
United Plant Workers of America

Requirements for alarm assessment, vital area doors that lock, and card-key systems should be retained.

83. Jim Riccio
Public Citizen

Agrees with Garland Shreves that requirements for alarm assessment, vital area doors that lock, and card-key systems should be retained.

84. Jerry Sims
Southern Nuclear

Remove doors that are locked and alarmed from physical security plans.

85. Jim Knubel
GPU

Agrees with Jerry Sims that doors that are locked and alarmed should be removed from physical security plans.

86. Jim Riccio
Public Citizen

Doors that are locked and alarmed should be kept in physical security plans.

87. Garland Shreves
United Plant Workers of America
Modify the present system of granting vital area access to workers in order to restrict access when it is not necessary for work.

88. Garland Shreves
United Plant Workers of America
At a minimum, continue with the present requirement to have a guard or watchperson at containment entrances to control access and materials.

89. Jerry Sims
Southern Nuclear
Eliminate the requirement for a watchperson at containment entrances.

90. Garland Shreves
United Plant Workers of America
Evaluate the upgrading of security measures, requiring security members to be armed while guarding containment entrances.

91. Jerry Sims
Southern Nuclear
Remove the requirement for re-searching armed guards when they reenter a protected area.

92. Lou Scohy
United Plant Guard Workers
Agrees with Jerry Sims that armed guards need not be searched when re-entering a protected area.

93. Jerry Sims
Southern Nuclear
Revise the regulation requiring an escort in vehicles driven by persons with unescorted access authorization (in protected areas).

94. Jerry Sims
Southern Nuclear
Revise the requirement for 1-hour reporting to apply only when a real security event has been confirmed.

95. Jerry Sims
Southern Nuclear
Delete the requirement for quarterly submissions of safeguards event logs.

96. Bob Whitesel
NUMARC
Substantially reduce the required drug-testing rates.

97. Jim Riccio
Public Citizen
Disagrees with NUMARC's recommendation to reduce testing requirements (i.e., drug testing requirements).

98. Garland Shreves and Lou Scohy
United Plant Workers of America
Do not adopt NUMARC's alternative protective strategy as submitted to the NRC in June 1992.

99. Jim Riccio
Public Citizen
Invite Bruce Hoffman of the Rand Corporation and representatives from the Nuclear Control Institute to the upcoming meeting on the design basis threat.

Quality Assurance

The importance of quality assurance was acknowledged, but comments on Appendix B to 10CFR50 indicated that current quality assurance programs emphasize documentation and compliance over performance. While more than one person made the point that the eighteen criteria of Appendix B are "sound, legitimate, appropriate, and sensible," there was a consensus that implementation of this requirement has not produced the desired results. Suggestions ranged from the very general call for the institution of a cultural change, to a specific plan of action for the revision of Appendix B, to the consolidation of all audit requirements in a single requirement for an audit program. The DOE program for quality assurance (DOE 5700.6C) was also cited as an appropriate model.

100. Lynne Goodman
Detroit Edison
Allow licensees to control their audit program, with the NRC providing oversight rather than control. This involves changes to technical specifications, regulations, regulatory guidance, and QA programs. In regard to technical specifications, there are three options for change:

a. Remove all audits from Section 6, and list them and the frequencies of core audits in the QA program (preferred option);
b. Remove all audits from technical specifications except the requirement to audit the QA organization; or
c. Remove only the audit frequencies from technical specifications, not the audits themselves.
In regard to regulations and regulatory guidance, consolidate all audit requirements into one requirement for an audit program and revise regulatory guides. Revise QA programs to include a listing of the audited areas and the frequencies of core audits.

101. Bob Hortstern
Mag Technical Services
Agrees with Lynne Goodman's positions on licensee control of QA programs.

102. Lynne Goodman
Detroit Edison
The NRC should do the following:
a. Meet with licensees on technical specification changes;
b. Review and approve submitted changes to technical specifications and QA program;
c. Review all rules and regulatory guidance on audits;
d. Propose a rule that consolidates all audit requirements into one rule (possibly just revise 10CFR50, Appendix B);
e. Propose changes to Regulatory Guides;
f. Approve revised rule; and
g. Approve revised Regulatory Guides.

103. Glen Perez
Pacific Gas and Electric
Eliminate Appendix B to 10CFR50 as currently written and replace it with a performance-based regulation (entitled "the assurance of quality") that would be the responsibility of the entire organization, not just a specific entity (e.g., the QA organization) within the overall organization. The regulation should simply state: prevent significant quality-related problems, detect the development of quality problems, and monitor the achievement of the quality process.

104. John Stevenson
Stevenson Associates
Agrees with Glen Perez that 10CFR50 Appendix B should be replaced with a performance-based regulation.

105. Glen Perez
Pacific Gas and Electric
Incorporate objective measures into the new regulation against which the utilities can be evaluated. Examples include a threshold for core damage frequency based on PRA techniques, and the selection of plant-specific components for trending based on a combination of PRA and risk analysis.

106. Glen Perez
Pacific Gas and Electric
In technical specifications, replace required compliance audits with various performance-based monitoring activities.

107. Jim Perry
Niagara Mohawk
Institute a cultural change that calls for single-point accountability by the line organization.

108. Bob Hortstern
Mag Technical Services
Agrees with Jim Perry that a cultural change calling for single-point accountability should be instituted.

109. John Stevenson
Stevenson Associates
Agrees with Jim Perry that a cultural change calling for single-point accountability should be instituted.

110. Jim Perry
Niagara Mohawk
Encourage defense-in-depth concept, with responsibility first by the individual, then the supervisor, then line management, and finally, the QA organization.

111. John Stevenson
Stevenson Associates
Agrees with Jim Perry that the NRC should encourage defense-in-depth concept, with responsibility first by the individual, then the supervisor, then line management, and finally, the QA organization.

112. John Stevenson
Stevenson Associates
Replace document-oriented approach to QA with a performance-oriented or sampling approach.

113. Jim Perry
Niagara Mohawk

Move from compliance-based to performance-based regulation in the QA area, with emphasis on results.

114. Roger Reedy
Reedy Associates

Agrees with Jim Perry that the NRC should move from compliance-based to performance-based regulation in the QA area, with emphasis on results..

115. Jim Perry
Niagara Mohawk

Where the impact on nuclear safety and reliability is low, specify technical requirements only, not formal QA requirements.

116. John Stevenson
Stevenson Associates

Use a graded approach to QA with three levels of QA:

a. Level 1 QA program for components in quality classes A and B (as defined in Regulatory Guide 1.26);

b. Level 2 QA program for components in quality class C (as defined in Regulatory Guide 1.26); and

c. Level 3 QA program for components in quality class D (as defined in Regulatory Guide 1.26). (Level 3 would be the baseline for any industrial facility.

117. Jim Perry
Niagara Mohawk

Apply PRA and IPE techniques to guide the application of a graded QA program.

118. Hershel Specter
New York Power Authority

Use risk techniques to screen for safety-significant components, then use additional risk techniques to determine whether the QA process for those important components is safety significant.

119. John Stevenson
Stevenson Associates

Use DOE 5700.6.C as a basis for revising the NRC QA procedure as stated in Appendix B. DOE 5700.6.C has 10 criteria (instead of 18), 9 of which are the responsibility of the project or facility management, not the QA organization.

120. Roger Reedy
Reedy Associates

Agrees with John Stevenson that DOE 5700.6C would be an appropriate basis for revising QA programs.

121. Don Hill
Washington Public Power Supply System

Remove coatings from 10CFR50, Appendix B (i.e., remove them from the safety-related category); allow industry to use state-of-the-art coatings; and limit the testing burden on coating manufacturers and utilities.

122. Don Hill
Washington Public Power Supply System

When reliable backup data are available, allow the use of commercially available coating materials.

123. Roger Reedy
Reedy Associates

Change Appendix B wording, even if the same principles and 18 criteria are kept. Otherwise, current interpretations will persist.

124. Roger Huston
TVA

Agrees with Roger Reedy that the wording of Appendix B must be changed if the interpretation of QA requirements is changed.

125. Alex Marion
NUMARC

Appendix B criteria are sound, legitimate, appropriate, and sensible; the problem is with implementation.

126. Jim Perry
Niagara Mohawk

Agrees with Alex Marion that while Appendix B criteria are sound, legitimate, appropriate, and sensible; there is a problem with their implementation.

127. Hershel Specter
New York Power Authority

Presents a recommended approach to using PSA techniques in the QA process (as presented to the NRC in a letter submitted 3-11-93).

128. Skip Copp
Duke Power

Agrees with the approach presented by Specter for using PSA in the QA process.

Requests for Information

Commenters pointed out that 10CFR50.54(f) had been used repeatedly to impose commitments on utilities without the benefit of formal rulemaking or backfit analysis. Virtually all of the comments called for controls upon the use of this regulation by the NRC.

129. Dan Stenger
NUBARG

Raise the threshold for issuing information requests pursuant to 10CFR50.54(f). Require determination that the concern actually represents a potential safety issue for all plants covered by the request.

130. Dan Stenger
NUBARG

Modify the language of 10CFR50.54(f) as follows:

a. For requests intended to verify compliance, require explicit identification of the existing regulation or other provision of the licensing basis for which verification of compliance is sought; and

b. Require that requests for new programs or extensive plant analysis be processed under the cost-benefit standards of the backfitting rule (10CFR50.109).

Specifically, in 10CFR50.54(f), add new third and fourth sentences that read as follows:

"Where the information is sought to verify licensee compliance with the current licensing basis, the Staff will identify the specific regulation or other provision of the licensing basis for which verification of compliance is sought. Where the information request would result in the establishment of a new program, including testing or analysis, or an extensive study using new criteria, in order to develop the information required, the provisions of 10CFR50.109 will be followed."

131. Michael Wilson
Northeast Utilities

Revise 10CFR50.54(f) to correct the following problems:

a. The language in the rule does not prevent the NRC staff from using it to impose new or revised requirements.

b. The justification of requests for information made pursuant to the rule can be inaccurate and subjective.

c. Without rulemaking, it cannot be ensured that the NRC staff limits its information requests to those that are consistent with the underlying purpose of the rule.

132. Sandy Kook
Entergy Operations

New regulatory requirements and positions should be made in accordance with 10CFR50.109 rather than through information requests under 10CFR50.54(f).

133. John Sutton
Yankee Atomic

When supplements to generic letters are issued, there should be an incremental assessment of what the licensees must do, and the original cost-benefit analysis of the request for information should be revisited.

134. John Sutton
Yankee Atomic

Establish a threshold or criterion (e.g., how many facilities are affected) for determining what constitutes a generic problem.

135. John Sutton
Yankee Atomic

Make the inspection module part of the total request-for-information package. That is, don't prepare that module after the request is put before the CRGR, but rather make it available along with the request.

136. John Sutton
Yankee Atomic

Return the CRGR function to the Office of the Executive Director, and provide increased resources to the CRGR staff.

137. Hershel Specter
New York Power Authority

Let the utility decide which design modification it will make to respond to a backfit analysis so it can choose the most cost-effective method of meeting the stated goal.

138. Dan Stenger
NUBARG

Three recommendations, from the Administrative Conference:

a. Nonlegislative policy documents should not be used very often; rather, the rulemaking process should be used;

b. The NRC must maintain an open mind, i.e., it must be amenable to alternative actions or alternative schedules proposed by affected parties; and

c. The NRC should establish an informal process through which affected parties can appeal from the requests of nonbinding documents in the context of 50.54.

139. Dan Stenger
NUBARG

Modify the NRC's management directive on the plant-specific backfitting process to include an informal appeal process from 50.54(f) requests.

140. John Sutton
Yankee Atomic

Ensure that the NRC staff understands where analysis numbers come from and can reproduce them.

Combustible Gas Control

141. Kurt Cozens
NUMARC

Resolve inconsistency between standard technical specifications and current regulations by deciding on and using consistent terminology regarding zirconium alloy-based fuel rods.

142. Kurt Cozens
NUMARC

Revise Regulatory Guide 1.97 to require hydrogen-monitoring equipment to be warehoused and available for installation/calibration if needed, rather than to be in standby.

143. Joe Burton
River Bend

For Mark III and ice-condenser containments, remove technical specification requirements for hydrogen purge, skimmer, and recombiner systems, or increase allowed outage times.

144. Mike Barrett
Duke Power

Agrees with Joe Burton that for Mark III and ice-condenser containments, technical specification requirements for hydrogen purge, skimmer, and recombiner systems should be removed, or allowed outage times increased.

145. Joe Burton
GSU

Where systems for mitigating severe accidents can also handle design basis accidents, they should be considered sufficient.

Appendices

Written Comments Received Following the Workshop

The following comments were excerpted from the written responses presented to the Nuclear Regulatory Commission after the workshop had concluded.

Comments

Roger Reedy

(Reedy Associates, May 12, 1993): In further support of the comments made during the workshop related to quality assurance requirements, the current focus and emphasis on documentation, rather than hardware and material, represents a misapplication of resources. If corrected, there should be savings of one billion dollars each year, based on 100 nuclear plant units and less than 10% of the typical nuclear power plant maintenance budget. An enclosed paper, given May 16, 1989 at the International Conference on Quality in the Nuclear Power Industry, provides examples of imprudent implementation of quality assurance regulations that resulted in excessive and unjustifiable costs. In addition, the focus on the adequacy of documentation, rather than the quality of hardware, results in misapplication of resources and a consequent reduction in quality. Appendix B needs to emphasize product quality, not documentation.

(Reedy Associates, May 18, 1993): In support of comments made during the workshop to the effect that NRC Information Notices 90-05 and 93-21 are invalid because they are based on incorrect interpretations of the ASME Code, an official ASME interpretation that Section XI, IWA-5250 does not apply to leakage at times other than during a system pressure test is enclosed to show that Information Notice 90-05 is incorrect. Information Notice 93-21 is incorrect because it states that the ASME Code prohibits overlaying an area of pipe that has been eroded or corroded, which is not consistent with the language of the Code, nor with any interpretation ever given by the ASME Committee.

(Reedy Associates, May 18, 1993): Integrated containment tests require accurate assumptions for the results to be meaningful. Local tests at areas known to have high potential for leakage are a better way to assure that there is no safety hazard to the public.

Dorothy W. Gaither

(May 12, 1993): Requests information on the effect of the proposed changes on the Brunswick County Nuclear Power Plant, and on the history of the plant. Expressed concern for the safety of nuclear power.

Ron Shackelford

(May 11, 1993): Based on the proposals under consideration to reduce or eliminate leak rate testing, weaken fire protection ratings by eliminating 3-hour fire barrier requirements (and related 1-hour reporting procedures), and reduce requirements for combustible gas controls and plant security, it seems the NRC is on the verge of eroding a long-standing philosophy of defense-in-depth and redundancy of safety systems for operating nuclear power plants. In view of the staggering maintenance costs of aging nuclear power plants, the proposed relaxation of requirements will do little more than delay the shutdown of the facilities for economic reasons, while increasing the potential risks to the public, both in relation to safety and economic liability.

Therese Vick

(Blue Ridge Environmental Defense League, May 12, 1993): Opposes the proposals under consideration to reduce or eliminate leak rate testing, weaken fire protection ratings by eliminating 3-hour fire barrier requirements (and related 1-hour reporting procedures), and reduce requirements for combustible gas controls and plant security. The NRC is essentially eliminating its own safety philosophy of defense-in-depth and redundancy of safeguards at a time when plants are aging and need more care and maintenance.

Richard H. Pinney

(NJ Dept. of Environmental Protection and Energy, May 21, 1993): Heard no proposals at the workshop that would eliminate unnecessary requirements and improve safety. Specific observations based on the workshop discussions are; the NRC must communicate the purpose and basis for each regulation being considered for elimination (no basis was identified for Type A testing intervals); ALARA should be applied to proposed changes in allowable containment leakage, reductions in leak rate testing, and elimination of leakage control systems; PRA is inadequately understood to serve as a basis for revising regulations; root cause analysis should be applied to the problem of over-regulation, and PRA should be used to strengthen regulations, such as 10CFR50.59 and the Technical Specifications. Proposals for less testing maintenance and inspection based on PRA results ignores the fact that the PRA input, such as equipment failure and personnel error rates, are based on the current requirements for testing, maintenance, and inspection. In the highly competitive electric power market, savings from reduced requirements will go to improved return and not to improved safety.

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11. ABSTRACT (200 words or less)

These are the proceedings of the Public Workshop on the U.S. Nuclear Regulatory Commission's Program for Elimination of Requirements Marginal to Safety. The workshop was held at the Holiday Inn, Bethesda, on April 27 and 28, 1993. The purpose of the workshop was to provide an opportunity for public and industry input to the program.

The workshop addressed the institutionalization of the program to review regulations with the purpose of eliminating those that are marginal. The objective is to avoid the dilution of safety efforts. One session was devoted to discussion of the framework for a performance-based regulatory approach. In addition, panelists and attendees discussed scope, schedules and status of specific regulatory items: containment leakage testing requirements, fire protection requirements, requirements for environmental qualification of electrical equipment, requests for information under 10CFR50.54(f), requirements for combustible gas control systems, and quality assurance requirements.

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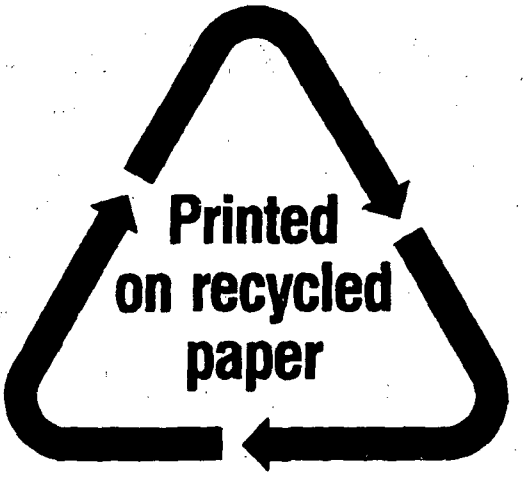

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