NUCLEAR REGULATORY COMMISSION

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

IN THE MATTER OF:

SUBCOMMITTEE TO DISCUSS

UNDERLYING CAUSES CONTRIBUTING TO THE TMI-2 ACCIDENT

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Place - Washington, D. C.

Date - Wednesday, 8 August 1979 **Pages** 1 - 133

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

Wednesday, 8 August 1979

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

SUBCOMMITTEE TO DISCUSS

UNDERLYING CAUSES CONTRIBUTING TO THE TMI-2 ACCIDENT

- - -

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

Wednesday, 8 August 1979

The Subcommittee met, pursuant to notice, at 1:05 p.m.

PRESENT:

Dr. Max W. Carbon, Chairman of the Committee
Mr. Myer Bender, Member
Mr. Harold Etherington, Member
Prof. William Kerr, Member
Dr. Stephen Lawroski, Member
Mr. William M. Mathis, Member
Dr. Dade W. Moeller, Member
Dr. Chester P. Siess, Member

PROCEEDINGS

(1:05 p.m.)

DR. CARBON: The meeting will come to order. This is an ACRS Subcommittee meeting to consider underlying causes which may have contributed to the accident which occurred at Three Mile Island nuclear station on March 28, 1979. We have set up this meeting to discuss several aspects of the NRC regulatory review process and the qualifications and structure of user organizations as well as NRC's role in several related aspects of nuclear power plant operation, such as operator training and qualification, response to accident situations, and so on.

This meeting is being conducted in accordance with the provisions of the Federal Advisory Committee Act and the Government Sunshine Act. Mr. Raymond Fraley is the designated government employee for this meeting. A transcript is being kept, and each speaker is being asked to first identify himself and speak with sufficient clarity and volume so that he or she can be readily heard.

We have not received any written statements or request for permission to make oral statements from members of the public, so we will proceed with the scheduled discussion.

Mr. Roger mattson will be the primary speaker for the NRC, supported by Victor Stello, Office of Inspection

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and Enforcement and others as appropriate.

Please note that Mr. Byron Lee, representing the AIF Task Force on TMI, is unable to be with us today as indicated on the schedule. He did send some related material, however, which has been distributed.

Roger, can we call on you?

DR. MATTSON: Mr. Chairman, we received Mr. Fraley's letter of July 19 and decided to break the agenda into two sections. I will make a presentation on behalf of NRR. Mr. Ed Jordan will make a presentation on behalf of the Office of Inspections and Enforcement, and he will cover items Roman numeral I(A) -- I'm sorry, I(D) and (E) and Roman numeral III(B) from the I&E perspective.

I think the way we've arranged the NRR presentation, it's a slight rearrangement of your agenda, and it will lead nicely to a transition to Mr. Jordan's comments at the end of my remarks. We were asked to make a formal presentation and leave a lot of room for discussion afterwards. There is some question in my mind that that will work, because I'm sure I'm going to say some things of interest to you where you might want to jump right in.

DR. CARBON: We certainly will.

DR. MATTSON: For the sake of continuity, for the broad brush treatment of these somewhat philosophical questions that you've raised, it's probably better to try to

forge ahead and get my formal statement on the record and then get Ed's formal statement on the record. But I'm sure there will be questions.

It's a pleasure to have this opportunity to meet with the Subcommittee and discuss some of the broader policy issues arising out of Three Mile Island 2. Mr. Denton sends his regrets at not being able to personally attend today to discuss what you have called the underlying causes of the accident.

The subject of the Subcommittee's interest today concerns a number of broad and fundamental questions to speak to what could be described as the way NRC does business. My talk this afternoon will cover the majority of the items on the agenda supplied by Mr. Fraley's July 19 letter to Mr. Denton.

One of the items on the agenda requests the views of industry groups. Rather than summarize those views myself, we have requested that the Atomic Industrial Forum's Ad Hoc Steering Committee be given an opportunity to address these questions. I understand that they have arranged for a separate meeting with the ACRS or this Subcommittee at a later date to do that.

By way of introduction, I'd like to briefly note that there are a number of significant efforts in progress that will have important input for the types of questions

under consideration today. As you are aware, there are the Presidential Commission on Three Mile Island, several inquiries by Congressional subcommittees, the NRC special inquiry, the NRC Task Force on Emergency Planning, various industry sponsored initiatives, and of course the NRR Lessons Learned Task Force.

These activities represent a significant dedication of talent and resources the product of which should be valuable to the regulatory process and the safety of nuclear power plants. My purpose today is to provide the Subcommittee with the latest thinking within NRR, recognizing that many more inputs will be forthcoming in the next few months and that these will help to shape the future course of the licensing process.

I'd like to turn first, as your agenda turns, to the NRC role in the licensing process and then, secondly, to the role of the licensee. As the ACRS is aware, the NRR safety reviews of applications to construct and operate nuclear power plants consist of a detailed review of the information provided by applicants in the preliminary safety analysis report and the final safety analysis report, as they are amended in the course of the licensing review in response to requests from the staff for additional information.

The required minimum scope of that information is

described in general terms in the Commission's regulations in 10 CFR 50.34. The nature of the staff's review is indicated in part by the required findings for issuance of a construction permit in 10 CFR 50.35. There it states that the Commission must find that the applicant has described the proposed design of the facility including but not limited to the principal architectural and engineering criteria for the design and has identified the major features or components incorporated therein for the protection of the health and safety of the public.

The regulations do not provide a detailed definition of the principal architectural and engineering criteria, although some guidance is provided by the general design criteria and by some more recent and specific requirements, for example, the ECCS acceptance criteria of 10 CFR 50.46. The actual scope and depth of the staff's technical reviews have evolved over the years as the staff's experience and expertise have increased, as operating experience and problems have accumulated. And in response to requests from the ACRS, the Licensing Appeals Board, and the public, the current scope of the review — that is the scope prior to Three Mile Island — is described best in the Standard Review Plan.

Each of the sections in that plan spell out the areas to be reviewed, the acceptance criteria to be applied,

and guidance as to the procedures used to conduct the review. There is a wide variation between and among the sections regarding the scope and depth of review and the methods utilized, these variations reflecting staff experience with reviews in that area with the problems that have been encountered in past licensing experiences.

The Committee has asked how detailed is the staff review. Because of the variations between and among review areas, a detailed answer would require a discussion of each of the Standard Review Plan sections. I do not propose to do that today. However, there are some generalities that can be addressed.

First, it is important to recognize that our review is basically an audit of the applicant's design and design methods, intended to provide reasonable assurance that our criteria and regulations are met. We do not and could not, in a practical sense, independently track every element of the design. The review procedures in the SRP sections attempt to identify those things which should be checked to achieve this reasonable assurance. Even so, every item in the Standard Review Plan is not necessarily checked on every review.

The introduction to the SRP states each section is written to provide for the complete procedure and acceptance criteria for all of the areas of review pertinent

to that section. However, for any given application, the staff reviewers may select and emphasize particular aspects of each SRP section as is appropriate for the application.

In some cases, the major portion of the review of a plant feature may be done on a generic basis with the designer of that feature, rather than in the context of reviews of particular applications from utilities.

In other cases, a plant feature may be sufficiently similar to that of a previous plant so that a de novo review of that feature is not needed. For these and other reasons, the staff may not carry out in detail all of the review steps listed in each SRP section in the review of every application.

A second general point is that our reviews treat only those systems and components directly related to safety. The definition of the term "safety-related" is somewhat subjective. It has often been the subject of disagreement and interpretation between license applicants and staff reviewers. However, in general terms, we know that systems and components whose functions are not relied upon in the analysis of design basis events and anticipated transients in the safety analysis report are not reviewed, except to a limited extent to assure that they are sufficiently separate from and independent of the safety-related systems so that failures in the

non-safety-related equipment do not prevent the operation of safety-related systems. This has led to a somewhat stylized analysis of design basis accidents and transients.

For example, multiple failures are not considered. Also, although no credit is taken for the functioning of non-safety-related equipment, little consideration is given to the potential debit of maloperation of these systems, nor, as the ACRS has pointed out, to systems interaction. Similarly, no credit is taken for operator actions during certain time frames, but little attention is given to the adverse effects of operator errors.

The third general observation is that there is considerable variation in the extent to which the staff independently checks the designer's calculations and calculational methods in some areas, notable ECCS performance calculations and some containment and subcompartment response calculations. The staff does check the results against its own calculations.

Until recently, this was seldom the case in the mechanical and structural design areas where reliance has been placed on applicants' statements that designs have been performed in compliance with the ASME and other code requirements. However, we have been increasing our use of benchmark problems in the engineering area to gain more

assurance that the applicants' methods are acceptable.

Our reviews have tended to be paper reviews in most areas with little examination of the actual hardware by any reviewers. However, the instrumentation and electrical reviewers have made formal site vists for many years. And more recently our protection reivews and the reviews of seismic qualification of equipment have included site visits.

With this description of the review process in mind, I would like to turn to those items on your agenda that raise questions concerning the adequacy of the current approach in the aftermath of Three Mile Island and the general self-examination process that has accompanied it. It is clearly appropriate that we critically examine the way we review plants. The Lessons Learned Task Force has included this as one of its major categories for long term study, and I would like to discuss our current thinking in this area.

DR. CARBON: Before you get into that, let me inquire for my own clarification. Basicially, the NRR review is the design, the design methods, and so on, and you review very little — maybe nothing, I'm not sure — in the way of operating procedures, maintenance procedures? I'm not sure. I guess you don't have very much review of operator training. It's primarily concentrated on the

design.

DR. MATTSON: That's a true statement. There is, of course, a review of operator training in the context of the operator licensing program, but the technical reviewers and the design reviewers make no review of procedures, either normal or emergency procedures, and no review of operator training for adequacy in light of the design features.

Perhaps the best way to begin, to consider constructive criticism, is to consider what can, and most importantly, what can't be expected from an audit type of review. Inherent to this type of review is the very limited amount of design verification that is conducted by the NRC. We perform verification only in a selected number of technical areas, for example, confirmatory calculations of ECCS performance. Such verification is intended to provide an additional assurance that licensees adequately conform to our criteria.

The Office of Inspections and Enforcement performs a limited number of verifications in the field to confirm that the plant is being built in conformance to the commitment made in the licensing process. And the architect engineer and their quality assurance programs. Sorry, I left something out.

Ultimately reliance is placed on the licensee,

the vendor, and the architect engineer, and their quality assurance programs to adequately and consistently implement the design of a plant. This concept of regulation presumes that a large percentage of the calculations, design detail, and so forth will never be checked by the regulating body.

The question is often raised, particularly after the discovery of errors in design or construction, whether such a process is acceptable. First, it is clear that by the nature of a limited verification review that the bulk of design errors will be discovered by the licensee or the vendor, rather than by the NRC. That is the fact. It does not indicate a weakness in any regulatory review. Rather it is the expected result of this form of regulation. It does, of course, highlight the need for very close scrutiny by a conscientious industry with good quality assurance programs at all levels of design, construction, and operation, and for continuing NRC evaluation of these quality assurance programs.

One aspect of the audit process was addressed by the Lessons Learned Task Force in its short term report where an unacceptably large number of operational errors leading to losses of safety function had been identified, Three Mile Island being the most dramatic. It is apparent to us that licensees have not been doing a good enough job in the area of operational quality assurance.

Possible solutions to this problem could embrace greater NRC presence and tighter inspection or some alternative which would stimulte greater industry attention to its basic responsibilities in this area. Relying on a limiting condition of operation resulting in plant shutdown is, to the Task Force, the preferred approach. Our rationale in reaching that judgement is equally applicable to today's general discussion of licensing reviews.

Simply stated, we believe the goal of licensing is to minimize design errors and operations errors by promoting attention to safety at the source. That is, on the part of the licensee, rather than through an increasingly complex system of regulation by NRC.

Drawing on this parallel, we believe that a criteria-based audit review is basically a workable system. It's consistent with our present statutory mandate. It provides for broad coverage of safety issues, and it is consistent with the amount of resources that can reasonably be expected to be available and in the near future. It relies, however, on a disciplined and conscientious attention to details by the regulated utilities.

There are, of course, several areas where our review does not do a good enough job, and our work in these areas will need to be upgraded. The Lessons Learned Task Force has already identified the identification of operating

experience, the review of operating procedures, more definitive consideration of operator actions, and more definitive consideration of non-safety equipment as areas requiring improvement.

Our recommendations in these areas will be forthcoming in September.

MR. BENDER: Roger, I'd like to ask this question while it's fresh on my mind and in line with your discussion. In your consideration of the evaluation of the design process which the licensees have used, have you come to some conclusion that the experience at Three Mile Island bears out the adequacy of current practice? You're telling us what you do, but I'm not sure that I can derive from that some conclusion that Three Mile Island hasn't changed your mind about whether that's okay or not.

DR. MATTSON: I'm tempted to say that, and what I was just saying, Three Mile Island, like other operating experience, tells us that there are weaknesses in the process that we use — the audit review process. It's our present feeling that those weaknesses can be surmounted without scrapping the basic concept. That is, that the audit review can continue to work, that is can do better. There are changes in scope, perhaps, from the audit review, and over the years there has been a gradually increasing change in depth of the audit review.

But the only alternative we see to that is replacement of partial review by a total review. And the difficulties of a total review are to us very overwhelming difficulties. They amount to the government taking upon itself responsibility for the safe operation of the plant. That is, reaching the final decision on all the points. They also are nearly equivalent to government operation and ownership of the facilities.

MR. BENDER: I'm not trying to challenge that.

DR. MATTSON: So while Three Mile Island shows us areas of that the audit review needs to reach that it hasn't, perhaps there are areas where the audit review has overconcentrated where it needn't.

We're still comfortable with pursuing this process at this point rather than saying that the audit review concept should be abandoned.

MR. BENDER: You had said earlier that the review process right now doesn't require systematic treatment of everything that's in the standard review plan.

I'm not sure now that I know whether the decision not to cover everything is done consciously and with complete concurrence within the management structure, or whether that's just a subjective judgment of the individual reviewers that are assigned to the project.

DR. MATTSON: Well, two responses to that.

First, I don't think Three Mile Island gives us much valuable experience about the standard review plan at all. The standard review plan was not used for Three Mile Island.

MR. BENDER: It came in after that.

DR. MATTSON: That's right. Well, its license was issued several years after the standard review plan. Staff action was for policy reasons excluded from the reach of the

standard review plan.

A second point is it's really not the arbitrary judgment of an individual reviewer as to what will or will not be covered in a particular case review, in theory, at least.

The senior members of the branch, the section leaders and the branch chief play a role in the exercise of that judgment. Those are people who have been, by and large, conducting reviews themselves or participated in the generation of the standard review plan.

And so the judgment is not arbitrary and capricious. It's more than quick; it's reasoned judgment.

MR. BENDER: I'll accept on faith that it's true. But if I wanted to see some documentary evidence of it, could I find any?

DR. MATTSON: We said about a year ago that SERs should begin to document what portions of the standard review plan were used and which were not used and for what reason for all plants.

We said that after some prodding by the General Accounting Office in its review of the licensing process. We've not implemented a process like that. We thought a year ago it was a useful idea, but the press of other business has kept us from doing it.

Of course, we have yet to issue an OL whose review was conducted according to the standard review plan.

So it doesn't make sense.

MR. BENDER: One last point. Could you give examples of things where the review was overdone and others where the review was not quite as good as you'd like to have seen it?

DR. MATTSON: Well, yes. Large break loss of coolant accidents. When you consider the detail that we've gone into since the late 1960s, both generically and on a plant-specific basis, to determine in conformance with the standard review plan and the Appendix K regulations on ECCS designs for large break LOCAs, I think that we can generally agree that that's out of proportion, especially in light of Three Mile Island, to some other areas that have gone begging in the same time frame.

You've been saying, we've been saying since the same late 1960s that there were areas that deserved greater attention. Transients were, of course, one of those areas.

MR. BENDER: Thank you.

DR. SIESS: Roger? There was an implication in that little exchange that if Three Mile Island Unit 2 had been reviewed for an operating license in accordance with the standard review plan, that things might have been different. Would it?

DR. MATTSON: Some things would.

DR. SIESS: Important things?

DR. MATTSON: I don't think overall review in

conformance with the standard review plan would have made a significant difference in the Three Mile Island course of events.

I don't think that anyone has reached that conclusion.

DR. SIESS: I think that there was an indication in some other meeting that opening the relief valve as a standard consequence of a common transient really was a violation of one of the general design criteria.

Is that in the standard review plan?

DR. MATTSON: No. But you remind me of something very important that is in the standard review plan that's never been implemented on any design, to my knowledge. It was put in there with the idea of its being implemented when the staff eventually turned greater attention to transients.

There is in the standard review plan a requirement for anticipated transients you consider single failures of the sort that the sticking open of the PORV would have been.

That kind of transient analysis, although not specifically ordained by the regulations and some even quarrel that the standard review plan may violate the regulations in that requirement, it's rather moot. It's never been implemented, with that exception.

I think the things that we have seen in the standard review plan, had they been done on Three Mile Island,

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would have made a difference.

Our secondary effects, containment isolation being a good example --

DR. LAWROSKI: Does the FAA have something resembling a standard review plan in their approval of commercial aircraft?

DR. MATTSON: I don't know the answer to that question, Steve.

Does anybody on the staff know that from our discussions with FAA? Warren?

DR. MINNERS: Warren Minners of the division of systems safety.

I don't think they do, but I don't really know positively. When you read their regulations, a lot of their regulations are a lot more detailed now, especially in the control area. They tell you exactly how controls of the cockpit should be laid out.

DR. LAWROSKI: In listening to Roger and recalling some of the things I remember hearing in the hearings going on now on the DC-10, I detected a great deal of similarity on the auditing and the problems of maintenance.

DR. MATTSON: I've read those same articles and I gather that what they're speaking of is more an analogue to our inspection and enforcement process in terms of auditing

What they're talking about is they don't review all

maintenance procedures, all maintenance activities, only spot check. And I think the analogue there is with I&E.

The question you originally raised was the analogue with the certification process, the design certification process. And Warren's information is the best I have. It's probably something worth researching a little better.

DR. CARBON: Roger, in answer to Mike's questions, you said something like the following. You more or less praised the audit review technique because the only alternative you mentioned total inspection and so on, has obvious drawbacks to it.

So one, perhaps, is good compared to the other.

I'd like to ask, though, were you also saying, or will you address the question, is the standard or the audit review plan itself adequate for what we need?

DR. MATTSON: I guess I didn't finish the statement. What I had intended to say is that the concept appears valid. The implementation needs overhaul, both in its scope and in its depth. And the increasing depth of something that's been going on year by year by year, you can extrapolate that out in time and you eventually may get to complete review. That would, of course, over a long period of time, disprove the conclusion I stated as a premise, which is that the audit process basically works.

I'm not sure if that helps you or not.

DR. CARBON: Well, not completely. Are you speculating or saying that we can stay with what you've defined as the audit review plan and have an adequate system? You say it's in the process of evolution and change and so on.

Of course it is.

But the kinds of changes that will take place in the reasonably near future as a follow-up to the kinds of work that the lessons learned and other committees are carrying out, will we end up 6 months, 9 months, a year with this modified installment to the point where you would say that it's an adequate system for national needs?

DR. MATTSON: I think that it clearly could be supplemented in the course of the next several years by a dedicated, retrospective review of designs already in operation and designs already under construction.

And that if I'm correct in that judgment, at the conclusion of that period of retrospective review, if we keep track of the changes as we go along and we keep them codified and documented, we will have new review requirements at the end of that period that could be applied to future designs, which will, in my judgment, define an acceptable audit review for future plans.

I don't know any technical way to test this question other than that way. There are political solutions, societal

solutions to the same problem. But they could take a different course. Judgment could be reached that the nation wants the government to have more knowledge, more control, more hands-on familiarity with the details of these missions and their operation and reach that judgment in relatively short order, build an agency with the resources required to accomplish that kind of oversight and responsibility within a few years.

That's not a technical solution, in my judgment. Looking at it from a technical perspective, I think it is possible to structure a review that is basically an audit in nature — somewhat broader, somewhat deeper than what we've had in the past, but acceptable.

Now part and parcel of that has to be a rededication, I believe, on the part of the nuclear utilities to the fundamental responsibilities that go along with that kind of system of regulation. And that is conscientious dedication to the details to see that things are carried out in the design and operation in a safe way consistent with the basic safety philosophy mandated by the Congress and regulated by the NRC.

DR. CARBON: You spoke of this evolution of the audit review plans perhaps requiring several years to reach this point that you speak of. By "several," do you mean 5, 8?

DR. MATTSON: I think this retrospective outlook and

some renewed higher level of assurance of safety could be achieved on a time scale of 2 to 4 years, 2 years being approximately the time scale it will take to implement the short-term lessons learned, 4 years probably being the time scale it will take to implement some of the longer term things like control room redesign and that sort of thing, and increased qualifications and training of operations organizations and things of a longer lead nature.

At the same time, taking concepts like the systematic evaluation program and adding to them to cover the 59 reactors in operation not currently within the scope of the systematic evaluation.

For example, I think the resources to accomplish that retrospective review are available, I think within the kinds of budgets that we've proposed for the Congress, the 20 or so unresolved safety issues and the few more that will be added by Three Mile Island, that the systematic evaluation program is some sort of reconsideration of backfitting items from the standard review plan could reasonably be accomplished in that time scale.

I also think in that time scale that there will not be a rush of new construction permit applications. And I suspect that the quality of the product of that 2 to 4 years of intense, backward looking activity will, in some measure, determine whether there will be more construction permit

applications.

I see us clearly at a crossroads with an opportunity to make improvements. Clearly, you need to make improvements and with judgments resting on how good a job is done.

But I would stick with the audit review in doing that. It'll be a somewhat different audit review. It may have to take advantage of concepts that we've talked to you about on verification and validation where the industry, in order to demonstrate that it has paid attention to the details, would be required to obtain a third-party verification and validation of some of those details.

It would surely involve some things like updating of SARs to provide current and consistent documentation of the safety features and safety capabilities of each machine.

Well, our study of the NRR review process has also highlighted the importance of the organizational structure that implements the review. We found several areas where the changes could be made to substantially improve the integrated results of our reviews.

As I've already described, the technical review of license applications is carried out in the division of systems safety by a number of branches having expertise in and responsible for a variety of technical disciplines. The integration of the technical review input is provided by a separate projects organization.

In a similar manner, the division of operating reactors is split along technical and project lines. This organizational approach grew out of the demands of the early 1970s for efficient, systematic reviews of large numbers of CP and OL applications.

The standard format and the standard review plan were developed to provide uniform guidance to both applicants and technical reviewers as to what needed to be contained in applications and what needed to be addressed in license reviews.

While this was a reasonable approach at the time, we believe that licensing and operating experience now available indicate that new approaches are now needed. One result of the old approach was the compartmentalization and specialization of technical review into discrete areas. This was a useful feature of the organization since not all branches reviewed application on the same schedule or to the same depth, although much effort was spent to identify branch interfaces, secondary reviewer responsibilities, if you will.

As a practical matter, this has not worked as well as it should.

Generally, we have found the following deficiencies flowing from these specialized or compartmentalized reviews.

First, a lack of uniformity across the cases.

Second, inconsistency in depth and technical content of reviews between branches.

Third, inadequate integration of cross-system interfaces.

Fourth, an insufficient awareness by technical reviewers of the relationship of their part of the review to the overall safety of the plant.

Several other organizational weaknesses have been observed. For example, a better transition needs to be established between those staff reviewers who perform the operating license reviews and those who are responsible for the plant during power operation. Even the simple act of transferring case review responsibility from DPM to DOR has not been well handled.

The TMI-2 accident has also highlighted the important interface between plant operations and plant design and analysis. Control room layout, operator training, and operating procedures should all have significant cross-fertilization with the design and analysis of the plant systems.

This has been lacking within the staff reviews due, in part, to an organizational segregation of the responsible branches and, in part, to the historical tradition of decoupling the reviews. It is clear that various organizational rearrangements could be effective in promoting

better integration of the technical review and solving the problems I've discussed.

However, I'll stop at this point and I'll describe or propose specific solutions to these organizational problems.

Clearly, we think improvements need to be made before initiatives are taken in this area. The director of NRR and the commission will undoubtedly have the benefit of inputs from the committee, as well as the various investigative and assessment groups chartered by the President the Congress, and the NRC.

Up to this point, I've been discussing the functioning of NRC on routine licensing matters. I'd like to spend a few minutes on accident situations.

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MR. BENDER: Before you go on, you replied to a question I phrased somewhat differently to a question I phrased earlier, but in a somewhat different way I thought.

The first time you answered the question, you said there was a supervisory section which makes sure things are done just right. If I heard you now, you just said that they are not being done too well; which is it?

DR. MATTSON: I used the word theoretically when I answered your question before. And perhaps I should emphasize that in principle it should work, in practice we find it doesn't work well enough; that is what I am attempting to say.

I meant to say it that way the first time. I said it better the second time.

MR. BENDER: It didn't come through too well.

DR. CARBON: A question along that line which you may have answered, but I am not sure I understood if so, is this point about the pressurizer level not necessarily indicating the level of coolant in the pressure vessel.

There have been discussions of this within NRC several months ago, and discussions of it within B&W, the vendor, for an appreciably longer period of time than that.

The kinds of changes you envision coming about here, do you envision those as helping to decrease the possibility that things like this will exist, that problems will be recognized, but that no action will be effectively taken upon

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them on a timely scale.

DR. MATTSON: No. There is nothing in what I have just said that I think really treats that problem effectively, not in my judgment.

Some may argue that the things I have discussed may help. I don't think they are sufficient; that kind of problem does need consideration. There are two things that I would look to in that regard:

One is simply they are both sort of organizationally oriented, they are not technically oriented. I think we are technically qualified in NRC and in the industry to be able to identify that kind of problem. But what we don't seem to be able to do either in industry or in NRC is to cope with those problems, given the practicalities of day-to-day matters, to bring them to the right people's attention, to deal with them and effectively resolve them and move onto the next problem.

I think those are organizational weaknesses, not technical weaknesses. And several things have been discussed with you already by various members of this subcommittee and the full committee. And I think we can do more to help that problem.

For example, the formation of a group of people who review operating experience. The NRC has recently taken steps to form such a group. We have decided within the past

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few days that the group will not report to the Director of Reactor Licensing. That is, they will remove such a group from the heat of the licensing machinery, the need to make day-to-day decisions according to the standard review plan or schedules ordained by the Blue Book and managed by managers.

And instead, set apart the organization, a group of people with broad, deep background in reactor operations, reactor licensing, fuel cycle operations, fuel cycle licensing, to look at operating experience, and then make judgments upon the priorities, the relative importance in individual instances or new pieces of information for factoring into the ongoing process, or for factoring into backfit decision and what have you.

I think that kind of an organizational approach is a good idea. It will help. It is a little bit to me like the way dissent in the agency was handed several years ago.

We had a situation where people have seriously held views, weren't being brought up the line for attention or being brushed aside in ways that were unsatisfactory, weren't being accounted for one way or the other, and went through a difficult learning period on how to manage and cope with differences of opinion within its technical staff.

Throughout that period, a number of people suggested techniques for resolution of these kinds of difficulties. And those recommendations were not accepted. They weren't used.

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Instead, a system of treatment of differences, reporting of differences, was adopted. That seems to be working.

But this organizational construction of setting aside a special group without the heat of licensing decision schedules to consider operator experience I think is equivalent to setting an ombudsman for differences of technical opinion.

You have to provide a forum for thoughtful and timely resolution so that things can be kept track of and don't get forgotten as other problems are being.

The second thing that goes with that is that you have to be willing, once you discover the solution or discover the problem, to apply the solution. That means you have to have ways to make backfit decisions. And we talked to the TMI-II implications subcommittee about that, and we are wrestling with that. It is something that needs better definition, better understanding, and better treatment in the future. That's the second part of what I am talking about.

DR. CARBON: It would seem that this example, though, still tends to fall in the cracks somewhere. Because I think it was Tom Novak's memo, I believe, that was based simply on analysis and so on, not on operating experience

If it was or wasn't, it doesn't matter, because you could have a case where you recognize that there is a design deficiency, but the inspection or operating group that you speak of wouldn't pick it up from that standpoint.

As far as I know, there is no question, there is essentially no question but what something should be done; it simply didn't get done. And I don't see where your suggested remedies --

DR. MATTSON: What I meant was that those things should be included in this organizational construction; they are not at this point. I would recommend that they should be.

I will give you another example besides the level indicator.

We talked here with the subcommittee last week about the San Onofre LER, with the flow straightener on the secondary side came off during normal operations. And the question then raises as to the dynamic capabilities of the internals of the reactor coolant system on the secondary system.

I promised we would go back and would look at that. We did. Jim Knight and his people reported back to me this week that it is their conclusion that there probably are some things that ought to be looked at, internals that have not received sort of a systems review.

They were put there for nonsafety reasons, and internal was added to a BWR as a flow restrictor for the steam line break. But, of course, that was a piece of safety equipment and it got this kind of review.

If, on the other hand, a flow straightener was put there because it got you an extra half a percent in power by

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a particular licensee who owned a BWR, then it wasn't put there for a safety reason, the Staff generally didn't review it.

In theory, such things meet the code. However, the code reads, and they ought to be quality equipment if they are inside a nuclear reactor.

But the regulatory process has never reached those things, and here comes the experience from San Onofre where one comes off in normal operations.

And clearly, the question is: What if a bunch of them came off, but one of them came off from a different character. A loss of coolant accident or an earthquake -- what is the safety implication of that, and what attention has been paid to those things in design and construction?

How do you take that now and factor it into the licensing process?

Jim Knight's people are quite confident that this kind of thing has never been done in the regulatory process. Clearly, it is a generic problem. Clearly, it is not as important as some other problems, but it seems like a fairly important problem.

The way the current machinery works is I would take that new item, write a letter to the Technical Activities Steering Committee, and ask them to categorize it as a generic problem and to give it some kind of priority.

You recall in the last six months or a year the

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Technical Activities Steering Committee took 130-odd generic problems, prioritized them, and decided that there were 19 unresolved safety issues. And NRC identified those to the Congress. We talked to you about that prioritization.

It was decided there are 19 things that Dr. Hanauer and his unresolved safety issues people are working very hard for resolution in the next couple of years, just like ATWS.

Along comes this new generic problem. The Technical Activities Steering Committee would have to, just in order to apply resources to that proble, vote, give it a priority, and decide that it was as important as one of those 19 or 20.

Then, if resources were judged to be appropriate to that problem, they would be assigned, the problem would be worked at for a couple of years, and the solution would be obtained.

That solution would come to the division director, who would mail it out for public comment. The industry would comment, probably kick and scream. We would factor those comments into the value impact assessment, take it to the Regulatory Requirements Review Committee. And the RRRC would say yea or nay.

Then it would be issued as a standard review plan modification or regulatory guide or whatever.

It seems an awfully difficult and tortuous path to have to resolve some new problem. But when you have taken

all of your resources and assigned them to things like the standard review plan to accomplish the minimum review required to assure public health and safety, it is the kind of process that has grown up over the years in order to manage one of the few resources you have left to solve generic issues.

That whole process needs to be changed. It is that process that people like Tom Novak in issuing his memorandum of January 1978 was staring square in the face. He either did it the way he did it, or he went through that long, tortuous process. Either way was probably inadequate for solving the problem.

When the Staff reaches judgments that here is an important safety question that ought to be resolved right now, send it out to those licensees and get them to do it -- there are so many licensees of such a different character, that the response comes back in some cases adequate, in some cases inadequate, and things like that aren't being effectively dealt with.

There need to be ways in the future for doing a better job.

DR. LAWROSKI: Your philosophy with regard to the responsibility for the safe operation is still that it is to be by the licensee, is it not? But I didn't find in what you had to say about things that are being considered with the NRC enough reflected about what to get industry to do that that

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responsibility is indeed discharged.

All that I seemed to hear was that we were going to increase the amount of regulatory activities without ascertaining what it is that industry should be undertaking to help with this task.

DR. MATTSON: Well, I'll say two things.

First of all --

DR. LAWROSKI: I know you have the responsibility of confirming.

DR. MATTSON: One, I will say what we think. And two, I will offer you some advice.

First. I spoke about conscientious and disciplined implementation of safety requirements by the industry. That's necessary. It has to be done, a better job has to be done.

You also know that we have proposed what others have called a very punitive approach to poor operational reliability. Those are things that come from regulators. It is the limit of our power and authority under existing law.

Now, let me turn the coin. We have been down here with the subcommittee and several other subcommittees and the full committee four or five times a month for the last four months. We have been here practically every time tellin you what we thought ought to be done to significantly improve the safety of the operation of nuclear power plants.

I think we have got some good ideas, and underlying

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that we keep saying this industry has the basic responsibility for safety, the licensees bear the basic responsibility for safety.

This agency, with these resources, can't accomplish safety by itself. Where have been the utilities and the vendors in the last three months in these discussions? They are in the room today, they have been in the room every day, they are listening.

Every time there has been an opportunity for them to comment, to my knowledge, those comments were received early in the process when they were under the pressure of bulletins and orders and you were able to ask them very specific things about what they were going to do to respond to the initial reactionary things that came from NRC.

If that basic responsibility is there, we need to begin to test the intent of this industry to meet that responsibility.

Your question in today's agenda about what the industry's intent is to answer these questions is a very important question. I think the meeting they have scheduled with you in September, if that comes about, can be a very important meeting.

What I am saying about the veracity of the audit process depends upon a dramatic response, in my judgment, from the regulated industry. And it is not evident to me, at this

point, there are people organized and identified who are approaching these problems.

There are individual licensees who have read the lessons learned reports. But the search and the examination of the industry's approach to the problems raised by Three Mile Island is yet to begin.

You haven't begun it, we haven't begun it. We will begin it in the lessons learned implementation.

DR. SIESS: Roger, there is essentially two functions that the NRC has to perform.

One is to set standards or criteria for safety.

The other is to see that they are implemented.

But setting safety criteria, you can obviously do it strictly on a performance standard basis. And to say that plants must be safe, obviously doens't work. So you go to a prescriptive procedure.

You prescribe the number of conditions that must be satisfied. And in your judgment, if they are satisfied, the plant will be safe, or safe enough.

And the secord step is to ensure by some means that these criteria have been met. One way is to do it with the audit function. The other is a punitive-type thing.

It seems to me you addressed the second much more than the first in your discussion. The things the NRC does to see that its criteria are met -- are we all that sure that

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our criteria are that good?

DR. MATTSON: We were discussing this in my office this morning. That's very important.

When I say audit review, I mean to include the setting of criteria. I think that the audit done by NRR really occurs in two phases.

The first is the setting of criteria. The second is the review of designs for meeting those critera.

Now, the setting of criteria, we do an audit sort of thing, also. We have got very general guidance from the Atomic Energy Act, general guidance from the regulations, including the general design criteria, somewhat more specific guidance in the form of regulatory guides to the standard review plan.

But all of those taken in toto are the tip of the iceberg. Underlying all of those are purchase specifications, performance test specificiations, nondestructive tests -- all these things that go into implementation to meet the requirements.

You heard Minogue and the standards people talk about the necessity for an underlying body of codified good engineering practice which NRC doesn't even touch with its regulatory guides.

It stays cognizant of, stimulates, keeps people producing the sorts of things that ASTM and ASME and other people work on year in and year out in the codification of

good practice.

If the tip of that iceberg, the criteria is too shallow, then the audit review won't function properly.

And I think there are indications -- not necessarily from Three Mile Island -- where that tip needs to be expanded.

The classic example, to my mind, is environmental qualifications.

DR. SIESS: What about single failure criteria? That's the cornerstone of this question of NRC criteria.

DR. MATTSON: Yes. And if underlying that, there are not other specifications or criteria or requirements in the purchase and construction and installation of that equipment, then single failure criteria won't do it. If you use a single failure criterion with basically unreliable equipement, it's not good enough.

DR. SIESS: I was backing off in the other direction. Even if the single failure criterion is implemented 100 percent, it still may not do it. The criterion itself may not be enough. That's what I'm asking.

DR. MATTSON: Well we're looking at that question. I didn't have anything specific to say about it today. We talked about it the last time we were down. Basically what we said was we think the single failure criterion as a design concept is a good one. We ought to keep it; we ought to supplement it. You'll recall we talked to Dr. Okrent and his subcommittee about reliability techniques as an overlay to the single failure criterion, the kind of thing we showed you had been down with aux feedwater systems for the Westinghouse and combustion engineering designs.

DR. SIESS: It's necessary but not necessarily sufficient.

DR. MATTSON: That's basically where we're coming down. Yes.

DR. SIESS: It's not as quantitative as we might get.

DR. MATTSON: That's right, or can get in some specific areas today.

DR. SIESS: We could be more quantitative.

DR. MATTSON: Yes.

PROFESSOR KERR: Roger, it seems to me that there is also -- you have said the objective is to achieve safe operation, and I think we all agree that that is the objective. And it is a dependable one, but in an organization as large as the NRC and as compartmentalized in some sense, it is sometimes difficult to keep that objective in mind. For example, in a sense the people responsible for setting these criteria are those in Standards, I guess, with input from the rest of the Commission in whatever way the input occurs.

Let's suppose that they do a very conscientious job of studying the situation and write regulations. Presumably the objective is to achieve safety. Now at that point, the rules of the criteria to be used by the industry and by the licensees and the regulators -- it is easy it seems to me and in some cases it occurs that at that point the people involved forget about safety and become concerned

with the regulations, particularly in environment where there's a lot of litigation and controversy.

The idea of achieving safety can become lost in the details of providing defensible positions at every step of the process. And this can be very discouraging, both to the regulators and to the regulated.

I recognize that, if my observation has any validity to it, it's hard to avoid what I'm seeing in some situations, but I also don't think it contributes to safety. I think it's easy for the objective to get lost in the regulations, in the defense involved, in the litigation involved therein, the auditing which can easily become a paper exercise rather than something which is contributing to safety.

I'm not trying to be critical of anybody because, in the first place, perhaps my observation is not valid. But in the second place, even if it is, I can see why it can occur. What I'm saying is that it seems to me that there needs to be constant attention on the part of both the regulators and the regulated that we don't get lost in the details of the process and lose sight of the objective.

DR. MATTSON: I agree completely with what you said. I think it's a valid observation. My model of a few minutes ago in response to the Chairman's questions about the Technical Acitivites Steering Committee and the

Regulatory Requirements Review Committee — that to me is the epitome to me of being caught up in the process of regulation rather than in the act of assuring safety.

DR. SIESS: This is an inevitable result of the prescriptive approach. Even if we killed all the lawyers, we'd still have it.

(Laughter.)

The more detailed you make your prescriptions, the easier it is for the person who's trying to implement the rules to believe that if each prescriptive requirement is satisfied, he's achieved the objective, even if he doesn't know what the objective is.

I'm not speaking against the prescriptive approach. I don't know of any other one that will work.

DR. MATTSON: Well, let me respond to that as best I can. One of the things we've talked about on the task force is how do we avoid the staff being drawn down a narrow channel to the nths of detail in a specific area, which probably gets results beautifully — the safest thing in the country — at the expense of missing the overall important safety considerations at a systems level.

Well, the only answer I know to that is that if the guy who's responsible down there for that detail did it right so that you don't have to bore in, then you can keep this higher view, and you can keep from being prescriptive

and being in somebody else's business. That is, how to choose one bolt from another bolt. But it depends on somebody down there with those details doing them right, which means that when you do an audit, you find out it's correct most of the time.

I'd throw in one piece of recent licensing experience to this discussion to add importance to it. Mr. Denton shut down five plants because of seismic design last spring shortly before Three Mile Island, and there was a lot of talk and consternation. And in his absence this week, I've had the occasion to sign at least one order and perhaps two starting a couple of those plants back up. Until the evaluation is complete, the most significant thing found, in my judgement, in the course of that reevaluation was not the so-called error in the algebraic summation but the fact that the licensees did not have full understanding of the as-built conditions of the piping systems. The hangers weren't where they were supposed to be.

DR. SIESS: The most interesting thing to me was that that was a surprise to you.

(Laughter.)

DR. MATTSON: Well I can tell you for certain, this agency has never reviewed the placement of hangers and followed through on the design and seen they were in the right place.

DR. SIESS: As somebody who has been involved in construction, that came as no surprise whatsoever to me. Now, do you make the system perfect or do you allow for such errors?

DR. MATTSON: It depends on what those errors are capable of doing to the basic safety premise. If those errors mean that the seismic design is incapable for meeting the requirements, then you'd better do something about it.

DR. SIESS: But you've been in an awful lot of buildings that have the same kind of erros.

DR. MATTSON: That's true.

DR. SIESS: Maybe in seismic areas.

DR. MATTSON: That's a good observation also.

MR. BENDER: Well, Roger, the thing that seems to be becoming the point of contention is how to determine the effectiveness of the audit, and the ways in which you can determine that have not been spelled out very explicitly yet. The audit I'm talking about is the one which is the NRC review. I'm not trying to create something new. We've sometimes said that LERs provide a measure of audit. Some people have said that operating experience as it is reported, never mind whether it's as important as an LER. But I've never yet had any way of determining from your presentation or from this 0578 how one determines whether the review process is adequate or not.

DR. MATTSON: And it's really a difficult question, you know.

MR. BENDER: I know it's difficult.

DR. MATTSON: The review process is completed significantly in advance of the accumulation of relevant operational data. The data that you're getting today is from plants that were reviewed according to a process that is much different than the process that's in place today.

None of these operating plants were reviewd by the Standard Review Plan. Their seismic reviews were done at a time when the seismic technology of the country was still growing. There have been significant advances in that field in the last ten years. The list of that sort is long.

How do you measure the quality of the audit review process? People have been wrestling with that question for a fair length of time, and the only answer we seem to come up with is: Make it deeper, and make it broader.

MR. BENDER: Well we know you don't have infinite resources, so depth and breadth have to be controlled. Also, we know that the review process will never be perfect. Hardly anyone could disagree with Dr. Siess that there are lots of construction errors and dimensional errors still in the plant over and above those you've found in the seismic review . You known it and so do I and so does everybody in this room. It's a matter of whether they're

important enough to have a serious impact on the safety of the plant.

DR. MATTSON: I guess you're implying to me that we ought to have better yardsticks for measuring the significance of the errors that we find.

MR. BENDER: Well I really think that that's the heart of the matter, because we're going to find mistakes all the time. If we weren't, we wouldn't be having an inspection process. It's not surprising that the inspectors find things; that's what they're there for.

But I really would like to have some more meaningful kind of an answer from the Lessons Learned Committee to help us form some judgement. I think we have our own opinions.

DR. SIESS: I'm not sure it's going to answer it, but you put it very well, Roger. The reason those five plants were shut down on the seismic analysis error was because nobody could judge how important that error was to the safety.

DR. MATTSON: Other than that it was pervasive throughout the plant.

DR. SIESS: Yes. The reason that the other 24 plants, which also did algebraic summations, were not shut down is that by that time people had gotten smarter.

DR. MATTSON: No, that's not completely accurate.

The five plants were shut down by and large because it was known that the error was pervasive and applied to a number of safety systems and applied to systems throughout the plant. In the case of subsequent discoveries in the use of algebraic sum, there's been part of what you talked about, that is better understanding and that it didn't make that much difference. Plus, in some of those plants, the error had been made on the primary system, and it turns out, despite what would be an early judgement that that would be worse, that that's better because the system is of bigger components, thicker components, and more regular geometry. And the difference between algebraic sum and better methods are not that large and can be easily demonstrated.

It was demonstrated in a number of days for a few of those plants. So that's some of what you say, but there's some other stuff in there, too.

DR. SIESS: Basically the systems we're dealing with and their interactions are so complex that it is very difficult to see how deviations affect safety. What I said about construction -- we know how to take care of those construction errors in design because it's a relatively straightforward relationship between an error in construction and how the structure behaves. I don't think we know that that thoroughly for the large complex interrelated systems in the nuclear plant.

DR. MATTSON: Warren wanted to say something.

DR. MINNERS: Maybe you wanted to discuss the Sandia study of the effectiveness of the Standard Review Plan?

DR. MATTSON: That was something that was started — the idea was born a year or so ago — to ask Sandia to take the reactor safety study techniques and some current thinking on value and impact in the Standard Review Plan and go off in an ivory tower and decide which portions of the Standard Review Plan were, in a sense, overkill — too many resources being applied to areas that didn't have that much to do with the overall risk of nuclear power plants. We saw some status reports on that early last spring, but I haven't heard anything about it since Three Mile. Have you Warren?

DR. MINNERS: I think we're working on Three Mile instead of that.

DR. MATTSON: That's one possibility for developing yardsticks for deciding what is and what is not important — in this case, deciding what's important for future designs. Frank was talking about deciding what's so important for plants already in operation, operating experience.

Well, let me go to the emergency response area.

DR. SIESS: One quick one. You mentioned the

problem of the reviewer getting deeper and deeper into things. Isn't this to some extent encouraged by the Standard Review Plan where the review has been so formalized that you can take one specific area and assign one specific knowledgeable individual — not necessarily an experienced individual but a knowledgeable individual — to review that part in isolation from all the other parts? So he tends to get deeper and deeper into it.

DR. MATTSON: Yes, the compartmentalization that I was talking about, that is the down side of the Standard Review Plan.

Jose, you're sitting back there. Are you moved to say anything? You're working in this area on the task force. Do you have anything to add at this point?

MR. CALVO: Jose Calvo from the staff.

I'd like to try this on the ACRS. I have not discussed it with any members of the task force, but one way to recognize the compartmentalization of the technical review and also the technological innovations, we also recognize that the Standard Review Plan has given some stability and predictability into the technical review process. I think that's from technical review perspective.

And it looks like the overall safety perspective somehow has been missed. It looks like that the interface between branches is getting worse and worse every day

because they are working in total isolation.

So to get around this, we're thinking of establishing a Technical Review Board composed of 50 percent technical managers and 50 percent technical reviewers, of which 25 percent of them will be assigned every year and will be replaced by a counterpart every year. These people will look at what everybody else is doing, and they will establish some kind of uniformity. They will challenge what is accepted as well as what was rejected, and they would maybe treat somehow this overall regulatory perspective background.

Anyway, this is one of the approaches that we are looking into right now.

DR. SIESS: It sounds like the ACRS to me.

(Laughter.)

MR. CALVO: It may be a mini-ACRS, but it will be flavored with the people that are actually doing the review there, and everybody will have his turn, and there will be a tendency for them to look at everything that has happened — the operating experience, what happened in inspection and enforcement, would all be factored into this. I think it will get the review out of the isolation and put it back into this Review Board, and it will determine if anything has been left out.

DR. MATTSON: I think it's an interesting concept

but more in my judgement for a different reason. Systems integration, I would say, is the basic reason for that. We've got a variety of systems branches responsible for integrating elements of the program, instrument systems and so on. But the Division of Systems Safety, for example, other than implementing the Standard Review Plan, performs no overall systems integration of the review process. Instead, we turn to individual project managers or managers within the Division of Project Management to accomplish that synthesizing and collating and other functions necessary to reach some overall systems perspective in the review.

The kinds of things Jose talks about, I think, would have merit in correcting some of the difficulties that come from the present process.

DR. CARBON: I'd like to raise one other question. The systems in other nations, are they all basically the same as ours?

DR. MATTSON: That is one question that we left out of the prepared remarks, but I do have some notes on that. First of all, my perspective on this is generated by participating in the IAEA safety standards activities for the last five years off and on. I had an opportunity to talk to Bob Minogue, who is the U.S. representative for that activity yesterday. It would be our judgement that based on the facts that all the developed nations participate in the

standard-setting activity and are fairly capable of reaching easy agreement upon both the content and the form of the standards documents, that is the things that contain the licensing and regulatory criteria, that our general understanding is shown by this experience to be true — that their level of regulatory involvement is approximately the same or slightly less than what you see in the United States.

Now one obvious question in this area would be what about those nations where the government both regulates and builds and operates nuclear power plants — the French, the Russions, the East European nations. The conclusion I've stated, in my judgement, is equally applicable to those nations. They are writing standards and developing regulatory procedures that are couched at about the same level of detail and involvement as ours. If anything, they're playing catch-up to us, as we have gotten more and more detailed over the past few years. They seem to be a step or two behind us. There are exceptions to that, of course, but as a general rule the system of regulation, the audit review, depending upon the licensee, in some coutries another arm of the government, the operating organization which is depending upon them for primary responsibility for safety, seems to be universal.

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PROF. KERR: Roger, this may seem like an irrelevancy, but do you have any estimate of what fraction of the people we're viewing have been inside a nuclear power plant?

DR. MATTSON: I would guess it's very high, in fact we've made quite an effort to be sure that that's true. I'd be surprised to learn that there has been someone in NRR reviewing plants for more than a year that hadn't been inside a nuclear power plant. We also make efforts to intentionally hire people with experience. You run afoul of revolving door policies when you do that, but there is a sense of spirited competition for resources in technology where we intentionally go out looking for people --

PROF. KERR: My impression has not extended to whether they've been inside a nuclear power plant. I guess I was not aware that there exist a large number of people who have had operational experience.

DR. CARBON: You said, a large number?

DR. MATTSON: There's been a large number of people who have been inside. There is not a large number of people who have operational experience, but it's not an insignificant number. It's probably not 50 percent, but it's probably not 10 percent, either.

PROF. KERR: We talked some about systems approaches in a general way. I would guess that some

perspective in operating a plant is almost a requisite of a systems approach. The experience can convince you to do some integrated thinking.

DR. MATTSON: We find that especially true in the Reactor Systems Branch and the IHC Branch, that that kind of experience is necessary, but I would not confine it just to operations. Design experience can accomplish pretty much the same thing. Being involved in a design organization who's responsible for putting the whole thing together.

DR. CARBON: Is this a good time for a break, as far as you're concerned?

(Recess.)

PROF. KERR: Go right ahead, Roger.

DR. MATTSON: Two points I think are important to note in talking about the nature, that I think are worth adding to the record. First, when the staff gets a new design for the most recent Westinghouse standard plant or the newest boiling water reactor, the audit review takes on a somewhat different character in that case. The entire standard review plan can be applied for that new design. Again, recognize the standard review plan by nature doesn't cover all of the details, but the words I was reading early in the presentation about the staff being free to pick and choose in the standard review plan based upon what it's seen before that would apply in a new design.

The other point was that the audit review has a number of characters in it. The staff doesn't audit, and licensing, the staff does audit inspection and enforcement. The ACRS doesn't audit. The Subcommittee audits at one level of detail, the full committee audits at another level of detail. The public doesn't audit. The hearing board doesn't audit. So there are multiple tiers of audit, but when you add up all the areas that are covered, they're somewhat broader than may have been implied by my earlier words.

And I think it's important to bear those things in mind. Well, I wanted to turn to the role in emergency situations. I ought to start by saying they're changing, that rule is changing, so the things I'm going to say are brief and subject to further thought as that rule changes.

The NRC's role during and following an accident and the capabilities of activities needed to be carried out to implement that role have been under accelerated review since TMI-2. The Task Force on Emergency Planning was established by the Commission on June 7th to critique the NRC's current emergency planning process and to develop a comprehensive action plan.

A draft Task Force report has been issued and will be finalized in the near future. Because of the encompassing nature of that effort I will limit my remarks

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to a brief retrospective of the NRC's emergency response role and an overview of new initiatives in this area related to NRR's activities. I believe that it would be worthwhile for this Subcommittee or perhaps the full Committee to arrange a separate briefing by the Task Force on Emergency Planning to discuss this topic more fully, just so we're clear in our understanding.

You will hear tomorrow in the full Committee meeting a brief overview on NRR's activities in emergency planning, in more detail than I'm about to present. But that, too, is only a part of the overall responsibilities of the NRC Task Force on Emergency Planning. NRR's is only a portion of that overall plan.

As indicated in the Emergency Preparedness Task Force Report, the NRC has not adequately defined its role in emergency response. The possible range of response roles ranging from monitoring to control of plant operations is only implicitly addressed in NRC planning and procedures prior to the Three Mile Island accident. To that extent, NRC's response during the accident was an ad hoc response.

Emergency planning cuts across several NRC office lines during the process of generating guidance to licensees and others; however, there are no effective NRC-wide procedures in place or organizational arrangements established to ensure that adequate and clear guidance

results. This lack is particularly important in view of the many interphases involved, including the licensee, the state, local authorities and other federal agency.

The emergency plans of all power reactor licensees have been reviewed by the licensing staff in the past for conformance to the general provisions of Appendix E to 10 CFR 50. Recently, additional guidance has been developed, primarily in Regulatory Guide 1.101, the emergency planning for nuclear power plants. But this guidance has not been fully implemented. The NRR staff plans to undertake an intensive effort over the next year to improve the preparedness by licensees at all operating power reactors, and those reactors scheduled for an operating license decision within the next year.

This effort will be closely coordinated with the parallel effort by the Office of State Programs to improve state and local response plans through the concurrence process. And the Office of Inspection and Enforcement's efforts to verify proper implementation of licensee emergency preparedness activities.

The staff effort will include upgrading emergency plans to satisfy Reg Guide 1.101, implementation of the related recommendations of the Lessons Learned Task Force, such as instrumentation to follow the course of an accident, the establishement of an on-site technical support center

and the creation of emergency operation centers near reactor sites to house multi-agency support personnel activities, improve licensee off-site monitoring capabilities and test exercises of approved emergency plans with the participation of federal, state and local licensee personnel.

Similar action plans are under development by each of the affected offices within the NRC. Through these plans there needs to be much better definition of accident response roles and better training of the technical and management staff of the NRC for crisis situations like TMI-2. No matter how the overall role of NRC is changed in the coming months, at this point I'd like to stop talking about the NRC role in assuring safety and switch to the licensee role. And I suspect unless you have questions on emergency preparedness which you're going to hear more about tomorrow, we'll move right into that.

DR. CARBON: Go right on.

DR. MATSON: The Committee has indicated its interest in a number of questions that we will broadly categorize as the licensees role. In particular, as it relates to plant operations. I'll begin this discussion with operator training and operator qualifications.

Modifications to the existing training program and the examination process for reactor operators will incorporate the lessons learned from TMI-2. Emphasis will

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be placed on the use of simulators, both as a training device and an examination tool. Unlike the present situation in which some, but not all applicants receive simulator training, in the future, each applicant for an operator's license will undergo training on a simulator representative of his facility. In addition the operating portion of the NRC license examination will be conducted on a simulator, during which an evaluation will be made of the individual's ability to manipulate the controls and to diagnose and respond to abnormal emergency situations.

If the individual is an applicant for a senior operator's license his ability to direct the activities of reactor operators will also be evaluated during a simulator exercise. Annually, individuals will be required to return to the simulator for training in routine and non-routine operation and for recertification of their ability to carry out responsibilities of their license.

In addition to the use of simulators, the curricula for training programs will be required to place greater emphasis on thermodynamics, hydraulics and fluid flow and heat transfer. Questions relating to these subjects will be incorporated into the NRC written examination.

Experience requirements for applicants for senior operator licenses will be increased through further guidance

as to what is acceptable power plant experience. In addition, once a plant is operating, an applicant for a senior operator's license must have at least three months continuous on-the-job training as an extra man on-shift.

In addition to these improvements in operator training and qualifications, the Lessons Learned Task Force has recommended the addition of Shift Technical Advisor to the control room operating staff. The role of the shift technical advisor will be to supply additional analytical capability on-shift to support the shift supervisor's command and control functions. The shift technical advisor will have a bachelor's degree equivalent in a science or engineering discipline supplemented by specific training in the response and analysis of the particular plant for transients and accidents.

It is also recommended that the technical advisor receive training in the structure systems and component design and layout of the plant, including training in the functions and capabilities of instrumentation and control, in the control room. In addition to the emergency operations advice function, the shift technical advisor is also to perform a routine engineering function as part of the plant operations organization.

This latter function includes the feedback of operating experience on plant operating procedures and

policy.

Another area of interest in your agenda was licensee technical support.

DR. CARBON: Excuse me, before you leave that first topic. Have you in the past specified curriculum requirements for operators being trained, and do you specify anything with regard to the qualifications of the trainers, the teachers?

DR. MATTSON: Jim Milhoan from the Lessons Learned Task Force will address that question.

MR. MILHOAN: Jim Milhoan, NRC staff. The answer to your question is yes. There are reactor personnel curricula established. It would depend on what phase you're talking about. For the purpose of this discussion, I'll be talking about a person with no previous nuclear experience.

Prior to obtaining a license, this person would be required at a new plant to go through a 12-week fundamentals course. He would also be required to go through approximately a three-month design lecture course, which would familiarize him with the NSSS design. He would be required to go through approximately a four-month simulator course combined with an observation course, of observing -- observations at an operating power plant. He would also be required to go through approximately a one-year on-the-job training course, which would add all those up equivalent to

approximately two years of training prior to obtaining a license in the power plant.

But your specific question, I think was related to the fundamentals course, which is approximately a 12-week course.

DR. CARBON: I wasn't aiming exclusively at that. It was a broader question of whether you specify in general what they have to study and how long the program is, and the qualifications of the teachers.

MR. MILHOAN: With respect to the qualifications of the instructors, we have not specifically addressed that in the past. We are addressing and recommending to the Commission that certain qualifications for instructors need to be addressed in further detail. That is a first step for recommending the qualification that the instructors hold a senior reactor operator's license. There need to be additional qualifications of the instructor.

We will be working with the newly-formed Institute for Nuclear Power Operations to define better qualifications for the instructors at the power plants.

DR. CARBON: And a senior reactor operator, then, I guess, from what you've said needs the same training at a minimum as a reactor operator, plus three months minimum of presence at the control board? I'm not sure, what's it again that makes a senior reactor operator?

MR. MILHOAN: With regard to the present training for a senior reactor operator, he would normally go through the same process as a reactor operator. We are looking at the upgrading of the qualifications of the senior reactor operator in the area of better understanding of thermodynamics, heat transfer, the basics course which would provide him a more updated capability for the senior reactor operator. That will be a longer term consideration of the Task Force.

DR. CARBON: And how much experience will he be required to have?

MR. MILHOAN: The senior reactor operator would be required to have approximately four years of experience. The numbers escape me, but two years of that four years could be credited to academic training. Credited for two years of that four years in these areas. Prior to becoming a senior reactor operator at a power plant, we're recommending that he serve six months as a reactor operator.

DR. CARBON: Thank you.

DR. MATTSON: I think if I could add to what Jim said, and then turn to the next question.

MR. MATHIS: Well, you mentioned the Institute, the training group that industry and the licensees have set up. Are you working closely with them in the development of these criteria?

MR. MILHOAN: The Institute is just in its formative stages; in fact, the site for the Institute has not been selected, nor the Director of the Institute. My understanding is that there will be a series of six regional meetings held from the period of 16 August to the 2nd of September to discuss the formation of the Institute, the policies for the Institute.

We have been in touch with Ramey Pack and Chauncey Starr, who have been selected to form the Institute, the policies for the Institute. We have requested a meeting with the Institute and we certainly are encouraged by this effort and we would plan to work very closely with them.

PROF. KERR: So the answer to Mr. Mathis' question is no.

DR. MATTSON: The answer is yes, they're just not there yet.

PROF. KERR: I thought he said, have you worked closely with the Institute in establishing these criteria.

DR. MATTSON: First of all, there is no Institute yet.

PROF. KERR: I was not being critical of the answer. I was trying to interpret it. I interpret it to be no.

DR. MATTSON: That's right. There is some question as to whether we should, to what degree should we

be involved in that activity.

MR. MATHIS: Well, Roger, earlier you mentioned the fact that the licensee is the person or the group that are truly responsible for safety. It would seem to me that that, along with the fact that you don't wish to get down into a lot of detail would say that this, on the part of the licensee and utility is really a step in the right direction to solve some of the problems. Do you wish to comment on that?

DR. MATTSON: Absolutely. I couldn't agree more. That's why I say it's not clear to me that we should be involved at the ground floor. I think we want to share philosophies as this thing gets started. I would look more towards a long-term involvement in maybe the same sort of way that NRC relates to the ASME boiler and pressure vessel codes. We accept the code as a way to ensure reliability of the pressure vessel. Once a person commits to meet the code we accept that. One might look forward to several years down the road, accepting a certification by a nuclear operations institute as sufficient qualifications for a senior reactor operator, once the qualifications set by that institute are examined and tested and found to be acceptable.

MR. MATHIS: And you would just follow on with an audit function basically to ensure you are doing it properly.

DR. MATTSON: Yes.

I wanted to turn to the area of licensee technical support. Current practice is for the NRC to review at the OL stage of licensing each applicant's technical resources available to provide backup support for the operating organization.

For normal plant operations, the special capabilities that should be included in this review are engineering expertise in the field of nuclear, mechanical, structural, electrical, thermohydraulic, metallurgy, materials, instrumentation and controls, plant chemistry, health physics, fueling and refueling, operations support, maintenance support, and fire protection.

The final safety analysis report is required to provide an organizational chart showing the management of technical support, headquarters structure. It also identifies qualification requirements for headquarters staff personnel in terms of numbers, educational background, and experience for each identified position or class of position providing headquarters technical support for plant operations, and it includes specific educational and experience background requirements for individuals holding the management and supervisory positions.

However, once a plant goes into operation, there is

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no further rereview of technical support provisions by the NRC. The Staff has not established definitive acceptance criteria for these technical support provisions to be required of licensed applicants.

We have generally looked to the utilities to demonstrate that some capability of each area of expertise does exist. Some utilities have extensive maintenance forces that move from plant to plant for major maintenance. In the case of nuclear plant, they would be assigned during the period of a refueling outage.

With these forces, they generally assign to the project several engineers with backgrounds in nuclear, mechanical, electrical, instrumentation and controls, to handle specific problems.

Where they do not have the needed technical depth or specific areas on their own headquarters or maintenance crew staff, the utilities would contract for the work.

In addition, they normally would have at least one chemist and health physicist under consulting arrangements to provide backup to plant staff. For small utilities, the backup engineering support may be less than a dozen persons.

This number ranges upward to the other end of the spectrum to perform their own architect, engineering services and have engineering departments numbering hundreds.

Generally, such home office support is available to

respond to a plant site for unexpected plant conditions. Generally, this is within a matter of a few hours.

All of the criteria in the review process that I have just described apply to normal plant operations. There is no regulatory guidance that consistently covers the capabilities or role of technical or management personnel during an emergency.

As a follow-up to the Three Mile Island accident, the Staff is conducting an overall review and evaluation of the management and technical resources available to utilities who own and operate nuclear power plants to handle unusual events or accidents.

As a start in this review, we requested that all power reactor licensees provide specific and detailed information that describes the capability of their management and technical staffs. The information requested is contained in a June 29th letter from Mr. Denton to all power reactor licensees. The deadline for response was July 30th.

It is clear that there is a lot of information coming in. Seeing some of it, it is in stacks.

It is too early to tell you generally what it says, but from a cursory examination, Staff is concluding that there will be changes in the requirements, a need for changes in the requirements for this kind of support personnel.

I should mention that the shift technical advisor

is also one step in the direction of improving technical support to operating organizations. Other ancillary changes have also been recommended in the short-term lessons learned report, such as the establishment of onsite technical support centers and onsite operational support centers.

The Staff is also working with the ANS-3 subcommittee in revising and upgrading the national standards in this area.

I would also expect that the Nuclear Operations Institute will have some opinions and role to play in this area.

MR. BENDER: Excuse me, Roger, you made reference to this operations group a couple of times, and it has been in the press mentioned once or twice. Is it really in being, and what is it?

DR. MATTSON: The Nuclear Operations Institute was announced by the Edison Electric Institute a month or more ago here in Washington. It is to be formed by EEI in much the same manner, as I understand it, as EPRI was formed, that is, with money from individual utilities.

It will have a board of directors of utility chief executive officers and people from other walks of life. It will have an Institute staff. It will set criteria for qualifications and training at all levels of operations or organizations, not just reactor operators and senior reactor operators.

Chauncey Starr of the EPRI organization, and a small

staff, have been ordained to conduct a 3-month study, as I understand it, to lay out the basic structure and operating philosophy and what have you for this Institute.

Mr. Milhoan has been in contact with that staff and knows some of the details.

I am to meet with Mr. Starr sometime in the next couple of weeks. The date that seems to be in my mind is next, and I will probably know more after that meeting.

It is my understanding that the industry looks to this Institute as one of the major forms of its response to the Three Mile Island accident.

MR. BENDER: Thank you.

DR. MATTSON: I was going to turn to the command and control function.

You identified a question in your agenda about the authority and responsibility of people above the supervisor to interject themselves into the recovery operation following a reactor accident. Are there any questions on the previous thing?

(No response.)

DR. MATTSON: We recognize this as having potential safety significance in our task force report, and addressed it in Section 2.2a. Control Room Access, where we said that a concurrent problem at Three Mile Island was that senior plant managers were included among those gathering in the control

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room.

Questions arose as to who was responsible for directing the activities. Only a licensed senior operator may direct the activities of licensed operators, hence the shift supervisor is in charge unless relieved by a senior licensed management representative or another shift supervisor.

The authority problem can be compounded if the senior member of management present in the control is not licensed. In that case, although he has responsibilities for overall safe plant operations, he does not have the legal authority to direct the licensed activities of the operators, nor does he have the proven knowledge of systems operation that is prerequisite to holding a license.

The task force's recommended short-term solution was to address the problem through administrative controls, which would require a member of plant management who assumes responsibility for the direction of activities to hold a valid senior operator's license.

Our position in this regard was as follows:

Licensees are to develop and implement procedures that establish a clear line of authority and responsibility in the control room in the event of an emergency. The line of succession for the person in charge of the control shall be established and limited to persons possessing a current senior reactor operator's license.

The plan shall clearly define the lines of communication and authority for plant management personnel not in direct command of operations, including those who report to stations outside the control room.

That's what we have done. I'm not sure that that was the full scope of the question, but I will pause there and see if there were other things that were of interest to you.

DR. CARBON: I think one thing that's of interest would be are you setting up qualification requirements for people above shift supervisor?

DR. MATTSON: We talked about that. We did not do it in the short-term report. We have ideas under consideration for the long-term report. Personally, I think I am going to be a little bit reluctant for the task force -- I haven't told them this yet, but I will tell them now -- to speak to those qualifications in the final report, other than to say that there ought to be some.

We know that the Nuclear Operations Institute has said publicly they are going to set such criteria. We also know that the ANS-3 subcommittee has already had a series of meetings, part of whose intent was to develop criteria and qualifications requirements for people other than senior reactor operators, people up in the organization.

I think we need to see how those things move along

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before the Staff promulgates criteria. If they don't move along, I think it would be quite logical that we would. I think there is need for it.

Jim wanted to add to that.

MR. MILHOAN: There are present qualification requirements in the ANSI standard ANS-3.1 which is endorsed by Regulatory Guide 1.8 for certain of the positions above shift supervisor -- by that, I mean the operations superintendent and the plant manager.

We have that guide out for comment at the present time. We will be reevaluating those positions in that guide.

DR. MATTSON: That's a guide that we specifically asked for comment after Three Mile Island on this particular problem, is it not?

MR. MILHOAN: That's correct. We sent out a Federal Register notice and asked specifically for comment on all courses of events.

MR. BENDER: Roger, I am sympathetic to the points you have made, namely, that maybe the regulatory staff shouldn't be specifying the capability of mangement organization, and perhaps even the technical organization at the highest levels.

It does seem to me, though, that you ought to be calling attention to some things that ought to be included.

For example, risk evaluation capability. I know that is one which is on everybody's mind. It seems to me that some

of those things ought to be culled out.

I don't want to make a list here, but without saying what the qualifications ought to be, I think consideration needs to be defined to some degree by the NRC so the public and industry both know what the important things are to take into account.

DR. MATTSON: That's an important comment. Another one that occurs to me is although it doesn't directly go to the question of what an individual is qualified to do, you might want to speak to what an organizational philosophy must contain and what structures within the organization would be supplied to carry out that philosophy.

For example, we have plant operating review committees that exist in most, if not all, power plants. It might be that it would be useful to restate, rethink, redefine somehow how safety decisions are being made day in and day out by plant operations management personnel, or maybe better yet, how safety is factored into all of their decisions.

We hear a lot about safety being the responsibility of the operations organizations. They have a competer for their attention, that is, economics availability. How are those two things counterbalanced in an individual organization?

If not enough attention is being paid to safety, which certainly some of the things I have said imply, then at what expense to these other things are those considerations

to be made, and how are you to measure whether that is enough consideration?

MR. BENDER: I have in mind the situation that exists at Three Mile Island, where two plants were built side by side. And it wasn't evident that the owners of the plants took very much pain to be sure that there was consistent basis for the two, as an example of things that one would think an owner ought to be responsive about if he is going to be sensitive to public safety questions.

MR. MATHIS: Roger, you mentioned the needs to have management philosophy of how safety fits into the picture. We have talked about this new man, the shift safety engineer. Do you care to comment how you picture him in the organization's structure and what his responsibilities are compared to the shift supervisor?

DR. MATTSON: Well, when he is advising the shift supervisor, he is clearly subordinate to the shift supervisor. In his normal duties, he is supplementary to and quite different from the shift supervisor. He is applying engineering expertise to the review of operating experience and operating policy to assure that operations are carried out in a safe manner.

So he might, for example, have communication lines directly to high engineering authorities in the utility organization that a shift supervisor didn't routinely have, having to go through a hierarchy of operations management.

For example, if the shift safety engineer is reviewing a LER from a plant of like design and he sees a difficult situation could be encountered in his plant for which there are no procedures or there hasn't been any well thought out plant response characteristics, nobody's run the codes, they hadn't requested the vendor to tell them exactly how well the plant responded in this particular instance that people hadn't thought of before --

I don't think the shift technical advisor would take that information to the shift supervisor, the SRO, and say, "Take this through the operations organization to get us an answer."

Instead, he would say to some higher engineering authority, "We need to pay our vendor or whoever to do an analysis of this situation. Give us some advice. Because my operations crew is not trained in this event and they should be."

And that authority would make some decision and see that that stuff was supplied.

PROF. KERR: I am [illegible] that you picked out this particular facet of his activity, because it seems to me that it is neither necessary that the person who do this be on shift, or that it be one individual.

The kind of activity you are talking about here, it seems to me, could be done almost anywhere within an engineering organization. It doesn't require somebody constantly

on shift.

I would have thought you would speak more to his emergency contributions.

DR. MATTSON: I spoke to his emergency contributions very succinctly; you are right. And I think that perhaps I agree with you, that there may be alternative ways to supply the emergency response expertise other than making it the same individual who supplies the LER review expertise. We talked to that in our meeting with licensees on August 1st.

I think that alternative approaches like that are particularly attractive to Mr. Denton. I think he is very interested in what the committee might have to say tomorrow on that score before he makes up his mind and recommends to the Commission where he thinks he ought to go with the shift technical advisor.

It might, for example, be quite possible, if it is acceptable for a utility to say, "I will supply that engineering operations safety function on the day shift with the following three or four people, than to give the expert technical capability in the control room for plant response diagnosis.

"I have got either this kind of qualification in my existing senior reactor operators, which is way beyond your requirements, or I have got it in this other member of the staff who is on shift, or I can get it within six months,

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or things like that, and we will put together a package of things that will accomplish the two functions that we have described for the shift technical advisor."

I think we have left open some flexibility for such approaches.

PROF. KERR: I would very arbitrarily try to divide the contributions into instinctive and contemplative. That sort of provides also a short term and long term.

It seems to me the instinctive responses could be very meaningful, but they can only be provided by somebody who is almost an operator type who keeps very familiar with the day-to-day functioning of the plant as it would normally operate and becoming familiar with the sort of things that might occur in an emergency, the sort of things that might have to be done in a hurry, and therefore almost instinctively.

The contemplative contributions, it seems to me, could be provided in a number of ways by some engineering individual or organization. In fact, I have difficulty in thinking of a way in which this could be most effectively supplied by somebody or some five people who would be on shift.

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DR. MATTSON: I think I don't disagree with the thought you've expressed, but I would add that in the instinctive response I think there ought to be engineering training, and it isn't there today, in the main, and in the main, it can't be provided tomorrow by SROs with engineering training. Yet, I think I would want it sooner than that training can be given to existing SROs. Hence, we came upon the concept of the shift technical adviser, and we're trying to be efficient in how people used him and serve this other function simultaneously; one, because they interact with one another and they help one another.

And having done it and seen quite an outcry, I think compromises may be in order where we see both functions are served, recognizing that the instinctive response are is an area that is going to see continuing change over the next few years as operators get better qualifications and training, and as control rooms become better in the sense of response diagnosis, display, and that sort of thing.

MR. BENDER: Again, to broaden the nature of the question that some of us are concerned about, how good a shift technical adviser could ever be, how well trained, the observations from Three Mile Island, I think, were that the important thing was to get a broader base of knowledge accessible to the operators in a reasonably short time.

Some of that knowledge came from the supply industry,

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and some came from the architect engineering support, and some from the operational support.

What attention are you giving to that capability and how to get that built into the operating support of the plant, and used often enough so that it doesn't become a first-time experience at the time of a national emergency?

DR. MATTSON: That's a good point, and I don't suspect that we have a satisfactory answer to you. I think we appreciate the point. About the only way we've spoken to it is to recognize that the need to communicate plant status information off-site is a need that extends not only to NRC, but also to the vendor and the architect engineer, so that they have the capability to communicate reactionary advice or information to the control room.

That whole system of defining goals and defining communications and leading eventually perhaps to drills is something that is going to take some time to think through.

MR. BENDER: At least it has to be something that is used often enough so that people know how to use it. It will never work unless you have something, unless it's tested fairly frequently.

DR. MATTSON: The last topic on your agenda was the subject of plant performance. Is the role of the licensee's relation to — I can't get it straight — the role of performance and management capabilities — that is, now they

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correlate? As I said earlier, we are conducting a survey to find out the management and technical resources currently available. Once we have that information, it may be possible to derive a correlation between management and technical capabilities, on the one hand, and plant performance, on the other hand.

We haven't developed such a study. And I suspect we wouldn't be adverse to it if it looks like the right thing to do.

We do have some history of evaluating licensee performance with which you could correlate this study of capabilities. Let me just summarize those:

In the Office of Inspection and Enforcement, there are activities which are designed to develop techniques for evaluating regulatory performance of NRC licensees. They have been under development for several years with intensified effort over the last two years. Here the words "regulatory performance" are meant to cover the ability of the licensee to meet regulatory requirements and to avoid the reportable events that appear to be directly under the control of the licensee.

I am thinking of your earlier comment, Mike.

The criterion is not safety; the criterion is meeting regulatory prescriptions. Regulatory performance does not involve reliability, availability, earnings, or other measures

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which may be used to measure performance. The licensee regulatory performance evaluation program is an effort to evaluate the regulatory performance of licensees on a national basis.

It has as its objectives: first, the identification of factors that lead to different levels of regulatory performance; and second, effective and efficient use of NRC inspection resources. The development of the IE licensee regulatory performance evaluation program has been described in a Commission paper, SECY-78-554, and some supplemental papers, if you're interested in delving into that in any detail.

Another I&E effort which may be related to your question is that of performance appraisal inspections. Such inspections provide a perspective for evaluating management performance. Performance appraisal inspections are thorough critical reviews of licensee facilities by a select group of NRC inspectors. They are chosen for their expertise and experience. The specific disciplines needed on a particular team are based on the type of facility expected and the type of problems experienced in that facility in the past, and other factors.

They are aimed primarily at the licensee's total control of plant activity. Performance appraisal inspections verify that the licensee's control systems assure adequate performance of safety-related matters. To date, only four

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performance appraisal inspections have been completed. There is another one, I note, that is scheduled for this month.

I think at that point it is probably useful to let Ed Jordan summarize the I&E responses to some of the agenda items and then throw the floor back open again for questions, unless you would like to elaborate a little more on this correlation of plant performance and management capabilities. We've done very little in that area. Data that's being developed may be useful, to try to develop such a correlation.

DR. CARBON: I would appreciate more discussion on that. I don't care whether it's now or later.

DR. MATTSON: Why don't we get the I&E program up on the table and see if we can tie it together with that discussion.

MR. JORDAN: Thank you, Roger. I appreciate the opportunity to respond before the ACRS to the questions that you proposed to the Office of Inspection and Enforcement.

Mr. Stello is presently in a Commission meeting, and so I am here to provide the response for I&E. He gives his regrets.

The first question that was directed to I&E was: What is the role of the NRC inspector, his effectiveness; and can his effectiveness be increased?

Our response is somewhat lengthy perhaps. But the role of the NRC inspection program is providing reasonable

assurance that the public health and safety are protected by monitoring licensing activities throughout the facility's lifetime. And you do key on public health and safety, and not specific regulatory requirements, at that point. At facilities under construction, this rule is satisfied by an inspection program which verifies that the facility is constructed in accordance with the construction permit in the FSAR.

DR. CARBON: Excuse me. Does it verify, or does it audit?

MR. JORDAN: It verifies through an audit program, so it is a sampling of the audit program. It is our intent that we are verifying the licensee is carrying out his obligations.

DR. CARBON: You are really checking a fraction of what he does.

MR. JORDAN: That's correct. A small fraction of what he does.

For operating facilities, this rule requires the determination by the inspection program that the facility is operated in accordance with the licensing conditions, the technical specifications, and NRC rules and regulations.

The inspection of programs for facilities under construction and for operating facilities are complemented by vendor inspection programs which examine quality assurance measures employed by the nuclear steam suppliers, architect

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engineers, and major contractors and suppliers.

This is admittedly a relatively small program in terms of the manpower devoted to it compared to the size of the organizations we are examining. All of these inspections are an overlay on the licensee's effort. The licensee has the responsibility for safe operation and safe construction of nuclear power facilities. The inspector has a check on the licensee, but he does not assume the licensee's primary responsibility.

The NRC inspection efforts are both planned and reactive. The planned program is implemented through detailed procedures which provides a consistent inspection effort across the country. This would be like the standard review plan. The inspection program recognizes the reactive nature of many of the inspector's activities and provides procedural guidance for reactor elements of the program. There we have fairly clearly, I think, satisfied that these are program requirements that we perform on an annual basis or whatever the period is, and these are planned elements.

Another set are reactive, where there is an incident, a licensee event report, or a particular problem with the facility, goes to the reactive aspects which we must respond to.

To accomplish this, the NRC inspectors perform inspections of specific licensee activities to verify the

applicable regulatory requirements that license conditions are complied with. This is the prescriptive approach.

The inspectors are also instructed to examine licensees' activities for apparent unreviewed safety questions when no regulatory requirement has been violated. We feel very strongly that this is an important aspect, that the inspectors are not there just to give out tickets for noncompliance, but to define safety conditions, to identify them, and provide the question back to the staff for resolution.

Individual inspectors who conduct inspections at operating facilities during the year include specialities of reactor operation, quality assurance, nondestructive examination, safeguards and security, radiation protection, and environmental monitoring.

In addition, specific plant problems may require inspection specialists in electrical instrumentation, metallurgy, mechanical engineering, or other engineering skills. Annually, approximately two man-years of inspection effort, totaling approximately 1080 man-hours of inspection, are spent on each operating reactor facility — I am sorry — reactor unit.

Of this, approximately 18 percent is radiation protection and environmental monitoring; approximately three percent is safeguards and security; the remainder is reactor operation with engineering support functions.

I think construction inspection and engineering skills applying at a particular facility are dependent on the stage of construction. The early site work involves, first of all, examination of the quality assurance implementation by the licensee and its contractors, a review of soil mechanics, concrete specialists. And this shifts in later construction to mechanical equipment, welding, and electrical, as the construction progresses.

An average of approximately .9 man-years of inspection, corresponding to approximately 490 man-days — I am sorry -- man-hours of inspection per year, are expended at each construction unit. Of course, this is an average figure.

PROF. KERR: Ed, it's probably a minor point, but I am having difficulty rationalizing a man-year with 500 hours.

MR. JORDAN: That's his on-site inspection time. The inspection effort that I am talking about is the inspector being physically on site performing an inspection of his review procedures. His development of a safety issue back in the regional office is not inspection time. This causes problems statistically.

PROF. KERR: When you say a man-year of inspection, you mean a man and that fraction of the time that he would normally spend inspecting?

MR. JORDAN: That's correct, and that's why I gave you both the man-year and then the inspection time.

PROF. KERR: I was just about to apply for a job.

MR. JORDAN: You wouldn't like it.

DR. CARBON: I end up confused, though. During the construction phase, you have nine-tenths of a man-year per unit.

MR. JORDAN: That's correct. Averaged over the construction.

DR. CARBON: That's saying that this man is devoting 90 percent of his time to the construction of that unit; but most of that time he is spending looking at records and that sort of thing in his own office; and a smaller fraction, a minority of his time, he actually spends on the site witnessing construction. Is that correct?

MR. JORDAN: Approximately 30 percent of his available time is spent on site inspecting; that's correct.

DR. CARBON: So, 60 percent in his own office thinking about the construction, and 10 percent of the time --

MR. JORDAN: Between preparing for the next inspection and writing up the results of his previous inspection and reviewing problems of noncompliance. That's the office time.

DR. CARBON: Then, for an operating plant where there are two man-years per unit, how much of that two man-years is spent by someone actually physically on site?

MR. JORDAN: That's the 1080 hours.

DR. CARBON: And I can't remember how many hours in a year.

PROF. KERR: A thousand hours. About 4000 is two man-years.

MR. ETHERINGTON: 6700-something.

MR. JORDAN: For a 20-hour week, it's about 2000.

DR. CARBON: So, about half man-year is spent by someone on site.

MR. JORDAN: Yes, that's correct.

At an operating site, about half a man-year on site. And I am describing the program as it essentially average out in 1970, and then it would shift into transitions that are occurring.

MR. ETHERINGTON: Is the time mostly flying visits, or does the man spend a month there or two months?

MR. JORDAN: The way this program was structured, the man normally spent about a week there, so he was there four days at a time. Not very much of it.

Where there was a reactive problem, he might go there for one or two days. Generally, if there were plant inspections, he was there for essentially a full week.

PROF. KERR: Ed, would you be willing to comment a little bit on how he gives attention to safety rather than enforcement of regulations? How do you distinguish them?

MR. JORDAN: That's a tough one. One of the keys is

bv assuring that we have a goal of an independent inspection effort, so he's not constrained by his detailed procedures; he's obligated to perform some 20 percent of his total effort in his own direction. He uses his engineering instincts, his experience, and his own personal skills to look at areas that he perceives to have a problem in. So, that's an incentive or a means to cause him to look beyond the regulation, beyond the technical specification requirements.

And the other is through the training program which stresses safety, stresses the plant operations, as opposed to stressing the regulatory requirements.

PROF. KERR: Suppose he concludes that even though the operation is not breaking any rules, it's not safe. How does he proceed?

MR. JORDAN: That normally would be a discussion with his immediate supervisor. And we've had those kinds of cases. The supervisor attempts to cause him to define this concern; and in those cases where he can, then he either states it is being unfounded or assists him by perhaps directing additional inspections that would find the problem.

So, it is true: Sometimes the inspector goes to the facility, and he perceives that there is a problem, but he can't put his finger on it. That's part of what this independent inspection effort is supposed to do: give him the ability to delve into those areas and define specifically what

the problem is, because if he feels there is a problem, he can't convey what it is to the licensee, the licensee can't fix it.

So, you know, if you're going to make it black and white, you have to clearly define it or you have to drop it at that point.

MR. BENDER: Let me try a little more explicit example and see if I understand it.

In the Three Mile Island accident, a lot of people said, "Well, if there had been an inspector there, he would have figured this out." Do you perceive of the inspector at the reactor site having that kind of capability?

MR. JORDAN: I would like to believe that he does. I certainly can't stand here and say that if the inspector had physically been there he would have.

Changes that we are proposing in our program would increase our probability, I think.

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MR. BENDER: That implies a certain amount of continual checking of operational actions.

MR. JORDAN: Exactly.

MR. BENDER: That's what you anticipate he will be doing: going around and actually seeing that the operations are being performed that are supposed to be performed in accordance with preestablished procedures?

MR. JORDAN: Yes. And challenging the preestablished procedures, as well.

MR. ETHERINGTON: You are really saying he'd have been smarter than the people on the site there; aren't you?

MR. JORDAN: He has a different viewpoint, and, generally, he has a better education.

Okay. Currently, the vendor inspection program —

MR. BENDER: Before you get off that, does his presence there relieve the operators of an obligation?

MR. JORDAN: No. That's how I started in the discussion.

MR. BENDER: I understand that.

MR. JORDAN: I think there is a possibility that a licensee would never concede that his responsibility had been taken from them, or he would perhaps give them willingly. But that's not normally the case. I have been an inspector, and I have not found that to be the case.

MR. BENDER: It's a function of how many times we

find things wrong.

MR. JORDAN: Yes.

MR. BENDER: So, the inspector has to exercise some judgment as to how much he is going to trust the operators to do things. If he repeatedly checks everything, then the operator will say, "Well, that's my check."

MR. JORDAN: That's right. That's a real threat, that if the inspector essentially signs off on a particular aspect, then the licensee would not look any further. He would like to be independent of the fact that the licensee has done his own quality assurance verifications, and we are subsequently doing ours, not replacing one with the other.

MR. BENDER: I would be happier if I felt that inspector really did see his job as an audit function, and not as a function where he would have caught the misvalving if it had occurred, some misvalving perhaps. I certainly wouldn't want to develop an impression in the operating staff that the inspector is expected to find the things that the operating staff is doing wrong, or some fraction of them.

MR. JORDAN: I believe that's the statement I made. Hopefully, he would improve the probability of catching the problem, and I would like to believe that he would catch this, but I can't say that he would catch them all.

DR. CARBON: Would you say a word about what a reactor operations inspector devotes his time to — and I raise

this question from the standpoint of the fact that I was surprised to find at Three Mile Island they had only a minimal checklist from one shift to another, and apparently the NRC inspectors had no connection whatsoever with whether there was or wasn't any sort of formalized checklist.

What does the NRC operations inspector look at; what does he put his time to?

MR. JORDAN: The time is distributed among a number of inspection procedures or modules. These are generally occurring on an annual basis, in addition to our quarterly inspection module. They are verifying — for instance, the licensee event reports are being currently reviewed, and the actions that the licensee has taken both physically and in his documentation are indeed correct. It would include observation.

DR. CARBON: How much of his time, what fraction, will he spend on items connected with LERs?

MR. JORDAN: Licensing event reports, what I give you would be an estimate. I could provide for the subcommittee —

DR. CARBON: Just a very rough figure: Is he spending 25 percent of his time on LERs?

MR. JORDAN: I would guess more like 15 to 20 percent. That would be my guess.

DR. LAWROSKI: Do the insurance companies send anybody around to do any inspection? It seems like they would

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be paying a pretty good amount, judging from what one reads in the paper in connection with Three Mile Island.

MR. JORDAN: Yes, they do. Some years ago we ran across them occasionally up there.

DR. LAWROSKI: You do run across them? That might be a pretty big bill that might be sent to them in the case of Three Mile Island.

In your opinion, is the amount of such inspection that you are aware of commensurate with the risk that they had arranged for with the utilities?

MR. JORDAN: I don't think I can even answer that.

What I have come across has been occasionally that they are on site at the same time that our people are.

DR. CARBON: Go ahead and spell out the remainder of those.

MR. JORDAN: The inspections would include a sampling of the licensee's procedures for periodic review on a rotating basis of procedures for adequacy or limitations. They would include examination of the licensee's maintenance activities, facility modifications that have occurred during a given time frame, in compliance with requirements of 5059.

DR. CARBON: What does he do with respect to their maintenance? Is it a procedure? Does he look into the maintenance as to how they did it?

MR. JORDAN: The object there would be to examine

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safety-related equipment and maintenance and identify from that problems with the licensee's quality assurance controls, to physically witness maintenance activities if they are in progress by the time he is at the site. And certainly, one of the lessons that we are learning presently is that we have to increase the amount of direct observation and witnessing that the inspector does. There is an optimum ratio, given a certain amount of manpower, between review directors and direct observation.

For instance, if the inspector did nothing but direct observation with, let's say, the two man-years of effort, then he can see a relatively small fraction of the activities at the site. But if he combines direct observation and review of records, it would cover a larger amount of material.

So, we have been striving to get some kind of an optimum between records and the actual review and observation, and I think we feel that the ratio, that we are shifting it increasingly to manpower.

DR. CARBON: You have a half-man per year at each unit, effectively. In this half-year time, how much of that is spent in direct observation versus looking at the records?

MR. JORDAN: I would say the direct observation would lie somewhere between about 40 percent, would be my guess, that he is actually physically walking through the plant or watching what an individual is doing, as opposed to sitting down with

the records or sitting down with the procedures and reviewing the adequacy of procedures.

DR. CARBON: Fine. Go ahead.

MR. JORDAN: It's kind of a rambling description.

MR. ETHERINGTON: Does the inspector have some kind of set routine or a checklist of things he wants to look at, or does he just roam at large?

MR. JORDAN: He has a routine. The inspection program — that is, the planned program — is laid out, as I said, for a year's interval, and so he is supposed to perform those particular inspection elements during that given year, and the sequence of performance is not important. They may be arranged based on the ability of the particular discipline in order to do that particular inspection.

So, if that answers your question?

MR. ETHERINGTON: Does he also walk into other areas which are not on this checklist?

MR. JORDAN: Yes. And that, once again, is the 20 percent independent inspection effort that he is directed to perform as a goal.

Okay. Within the plant program, then, we have, as I mentioned, safeguards and security inspection. These are specialists in those areas who review the systems, the equipment, the procedures, and do some direct observation and testing of the system, so far as the plant security provisions

go. We have rad protection specialists who come to the site, split samples with the licensee; that is, take samples of radioactive water and separately run analyses and take filtered elements, verifying that the licensee's labs are obtaining answers in agreement with our lab's.

We examine their environmental monitoring program -- that is, their off-site monitoring program -- and split samples with that.

The in-service inspection, for instance, witnessed selected examinations of piping welds, veryifying that the proper procedures were being applied, that the personnel performing the test were adequately qualified.

DR. CARBON: Fine. That answers my question.

MR. JORDAN: I have not scoped it adequately, and I can provide you with a document.

DR. CARBON: Yes.

MR. JORDAN: Okay. Roger has already mentioned the performance appraisal team, and I will just very simply say that the performance appraisal team is an overlay in addition to the inspection program that I have attempted to describe. This team conducts special inspections at selected facilities which provides an evaluation of the licensee performance and also reviews the implementation of the inspection program on the national scale. So we're looking across the whole country and not just on a regional basis.

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This team is limited in size. Only a few facilities are inspected on an annual basis. This would be based on a perceived need and then subsequently by the team on a rotating basis. The program of inspection has evolved over the past 20 years as the nuclear industry, the safety technology, and the safety awareness of the public have grown.

The dynamic nature of this program is evidence of I&E awareness that program effectiveness can be improved upon. A number of evaluations and studies have been conducted to improve effectiveness of the inspection program. In addition, audits have been conducted by GAO and OIA, which provided recommendations for increasing effectiveness. Studies by the

Studies by the NRC and contractors to date have not identified ways to substantially increase the effectiveness of individual inspections. In other words, it's our view that we can certainly always improve an individual inspector's relative effectiveness, but it's a diminishing-returns type of affair. We only need so much work out of an individual; we can only direct him so far; and then there becomes a need for a different program, added manpower, or redirection.

The two major areas for increasing inspector effectiveness in recent years have been the development of a formalized inspector training program to improve the technical skills and inspection skills and the adoption of a revised inspection program which places the resident inspector at each

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operating site and at construction sites in the later stages of construction.

The performance appraisal team, which we discussed earlier, is also a component of the revised inspection program. Currently, 19 operating units -- these are sites, rather — and six construction sites, plus two fuel facilities, have resident inspectors assigned. Subsequent to the Three Mile Island event, an extension of the revised inspection program has been proposed so that additional resident inspectors will be assigned to operating reactors on a unit basis.

The proposed unit inspector program also provides for assignment of resident inspectors to certain construction facilities in the early stages of construction. These would be either problem facilities or the first use of a facility by that particular utility. The unit inspection proposal has been submitted to Congress as a supplement to the 1980 budget. This program will substantially increase the numbers of tests of the licensee's program by NRC inspectors.

Under the unit inspection program, for the first time, some elements of licensees' activities will receive 100 percent inspection. Areas which will receive 100 percent inspection over a given time interval include line-up of safety equipment, changes to emergency operating procedures, direct observations of control room activities. Surveillance testing and maintenance will also be substantially increased.

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In summary, significant changes have been made or proposed to the inspection program in terms of a change in direction from the previous audit and sampling to a full inspection of certain selected areas. These changes do not minimize or change the licensee's responsibility for safe operation of the facilities. Instead, this resource allocation is expected to add to the inspection activities and result in significant improvements in licensee safety performance.

Changes in the inspection program are ongoing, and further evaluation of the Three Mile Island investigation results and Lessons Learned, as expected, to result in further improvements in the inspection program.

That's the discussion I have for the role of the inspector and effectiveness.

MR. ETHERINGTON: If you had an inspector at Three Mile Island and he is the kind of man who would have recognized the problem and remedied it immediately, the chances are only one in three or one in four that he would have been there at the time. So his value really would be if he had been able to educate the people in advance to this kind of thinking.

Do you look on your inspector as an educator in any sense, or just a man who will be there in case they have trouble?

MR. JORDAN: I would not look on him to correct the licensee's staff. I would look on him to identify to the

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licensee's management that there is a problem with the training level, for instance, of operators, if indeed there is.

MR. ETHERINGTON: Do you think some such function would have applied in Three Mile Island, supposing he had not been there at the time that the problem developed, but had been there perhaps a year previously on his permanent assignment?

MR. JORDAN: Do you mean that his presence would have warded it off?

MR. ETHERINGTON: Could his presence have had a general beneficial effect?

MR. JORDAN: I have to believe that, or I wouldn't be here.

MR. ETHERINGTON: How would that operate; I guess that's what I am trying to understand.

MR. JORDAN: The whole problem is that we can identify the breakdowns and failures in licensee performance, but I can't identify to you the successes of the regulatory processes.

MR. ETHERINGTON: He would have had to have spotted sometime during the previous period a deficiency in operator training or an understanding of the process.

MR. JORDAN: Right. Or in their quality assurance measures. All of those things.

MR. ETHERINGTON: You would anticipate this is how he

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would operate, not through his presence at the time of the emergency?

MR. JORDAN: I think once the emergency has been initiated, as you say —

MR. ETHERINGTON: It's too late.

MR. JORDAN: It's too late. I would hope he can offer suggestions —

MR. ETHERINGTON: That's what I meant by "educating."

MR. JORDAN: But he would not, as we envision it now, assume the management and control.

MR. ETHERINGTON: Of course not. I didn't suppose that.

DR. CARBON: Does it follow from that that he doesn't need to be assigned there, that you could simply have your people spend more time in the spot?

MR. JORDAN: That is certainly the case, the way we found that we can get people to spend more time at the plant is to make them resident inspectors. We have tried very hard setting goals, through studies of the inspection process, to increase the manpower per man-hours of inspection of the facility with the program as we have it, because managing a resident program is difficult, and we couldn't do it. We had reached an optimum amount of inspection time.

DR. CARBON: You couldn't get your inspectors to be physically at the plant all of the time?

MR. JORDAN: That's correct, because of the other activities. And you have to also recognize that the resident inspector, when he is physically at the plant, he still has to write his report, he still has to read correspondence involving the facility, and he still has to prepare for the next inspection. So, we are not getting all of that as inspection time.

DR. LAWROSKI: Since not all of the information useful to the determination of whether the plant is safe or not exists at the plant, have you thought of perhaps sending some of the inspectors to the suppliers -- namely, the NSSS -- where they might look at information such as has come out recently, that there did exist in the case of Three Mile Island what appears to be very well thought-out analyses that pointed to the possibility of the kind of event that did occur there, that that might be a more efficient place to look?

MR. JORDAN: That's a consideration.

DR. LAWROSKI: It's true they're not a licensee, but you may have to broaden your thinking to include ways of either looking at designs or even memos. We need to find a better way to get called to the attention and action implemented when something is learned like that, without -- because somebody also has to separate the chaff from the kernel of grain.

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DR. MATTSON: That's a thought that has occurred to several people over the last few weeks. Someone reminded me this morning of the war years when the government had representatives in supplier organizations around the country doing that kind of thing.

Another indication of a possible need --

DR. LAWROSKI: Didn't the Navy, the nuclear Navy have some of this?

DR. MATTSON: Yes. Another possible indicator of something needed in this area is the work that Dr. Rosztoczy did with the Region IV vendor inspection people last winter, where they went around to the four reactor vendors and went through their systems for assuring quality and verification of analysis codes.

I don't remember if they issued a report. I know there was a draft right before Three Mile. But the base is still there.

The basic conclusion was that there were systems and the people did pay attention to this problem, but there were clear deficiencies in them.

For example, the systems all spoke to the need to verify, yet they didn't speak to the time scale upon which verification of design codes should be completed. Similarly, systems all spoke to the need to identify new information, differing views, and resolve those views. None of them said

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how soon.

So it would be possible for an analyst or a designer in a vendor organization to bring up a safety problem or a potential safety problem, and under their existing procedures by and large simply the identification wasn't good enough. Other work and priorities could displace the need to resolve that new information in a timely way.

It is a problem analogous to the kind of thing I was describing earlier for the license. And some system of better assuring that these things get taken care of probably is necessary.

The Three Mile Island experience and the things we have learned since Three Mile Island teach us, maybe with some urgency, that it can be corrected. Whether that means placing a resident vendor inspector in Pittsburgh and San Jose and Lynchburg and Windsor, I'm not sure, but there is an area that needs more attention, I think.

MR. BENDER: The FAA has a scheme that is used in the aircraft industry. They use what is called, I think, a designated engineering representative, DER, and he is in the employment of the manufacturer, actually. He is selected for personal qualifications to sort of represent the FAA in evaluating the things that come up in the engineering process.

I am not sure this is exactly analogous to it.

DR. MATTSON: It is in the same area. There is also

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the concept that TVA has developed as a result of Three Mile -- the special -- I can't say the name of it, but a sort of safety review committee that sits in the engineering organization and considers matters of this sort.

They are all in the right ballpark.

It might be that the Nuclear Operations Institute will speak to that kind of thing, too.

MR. BENDER: I wanted to ask one question about the qualifications of the inspector. I think there is an inclination to say that the inspector who is inspecting the operation ought to have an operations background. Do we really know what the qualifications ought to be? Have we thought about all the things on the qualifications of that inspector?

MR. JORDAN: That does turn out to the be the next item I was going to discuss.

MR. BENDER: Well, I will let you discuss it.

MR. JORDAN: That is an easy way out of any other questions.

DR. CARBON: I have a question before you leave that.

You are talking about the evaluation team. It is a question there -- I think some user organizations must operate in an appreciably safer fashion than others. Have you ever been able to quantify anything like that?

And then second, can you correlate the safety of operation, the number of times that important safety systems

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are out of service, can you correlate something like that versus any qualities or characteristics of the management people?

MR. JORDAN: We have attempted to. And Roger mentioned them in his discussion.

Licensee performance evaluation have been to review licensee event reports, and all licensees with a given scale, grading it according to seriousness of the occurrence, then to look at the noncompliances identified here.

And given the time frame by each of the inspectors at each of these various facilities, and to try to make a determination from that plus the licensees projected judgment as to the performance of the licensee, and make statements about this licensee is the top of the batch, this licensee is average; this one is at the bottom of the batch --

Those are very difficult. We can give a presentation on the results and the work that has been done to date, but we are not ready at this point to propose that we have an answer for it.

One of the functions that the performance appraisal team will be looking at on a nationwide basis at licensee performance -- I think doing that on a consistent basis will be beneficial. If we are not doing it in the same time frame, then there is no basis for comparison.

What we will likely to is to feed back into the

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inspection program, yet we need to augment inspections at this facility in this area, because -- or we may utilize our manpower more efficiently by dropping inspections in this area, because --

So it would be a redirection of our resources based upon this overview on a national scale.

DR. CARBON: Am I correct in believing that some operator licensees run their plants in appreciably safer fashion than others?

MR. JORDAN: I think that's the case. Our position is that they have been acceptably safe, or we would issue an order for them to shut down. And so, naturally, the threshold -- and where we have concern for management or a particular facility, then we make those concerns known to the licensee and he takes corrective action.

So if we have the view that this particular licensee has a problem, then that's what we are for, to identify the problems, then to get the necessary correction in a management sense.

Now, one other thing we did a number of years ago, about four years ago. We conducted what we called management inspections, facilities across the country. This was a system inspection of the various plants, both corporate office and the site, in management control-type areas.

While that has been official, it was in some sense

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identification of large numbers of noncompliance, of a minor nature, let's say, indicating perhaps a management breakdown, but not indicating safety problems.

So we run the risk then of not making it directly safety, we focused on the management. Certainly there is an impact, but it is tenuous.

DR. CARBON: Question on a different topic.

NRC inspection during construction. The West German TUV system is quite different from ours, I think. Are there merits in their system? Is their system better than ours? Is ours better than theirs?

MR. JORDAN: I honestly haven't made any comparison with their system -- with the Canadian system, but not with the West German.

DR. CARBON: Is the Canadian system similar to ours?

MR. JORDAN: Quite different.

They have sort of collapsed the enforcement, inspection, and regulatory review process into one organization. They don't have discrete components, and the inspectors are largely onsite -- I'm sorry, their regulatory force is largely onsite.

They have a small central office, but they have a relatively small number of reactor units involved in the review process.

As the program grows, then the difficulties are going

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to change.

DR. SIESS: What aspect of TUV were you talking about? Construction inspection?

DR. CARBON: Construction inspection.

DR. SIESS: Because some parts of it compare directly to the pressure vessel code third party inspection. When you get in the area of anything that comes out of ASME, there is not that much difference.

DR. CARBON: Well, the TUV inspectors have the authority to stop construction.

DR. SIESS: So does the boiler inspector.

DR. CARBON: It's my impression that in practice the TUV inspector truly operates as a much more independent person and exercises his authority appreciably more than our inspectors do.

DR. SIESS: More than our I&E inspectors, but you are trying to compare TUV to boiler and pressure vessel inspectors.

DR. CARBON: All I am saying is from what I have read and understood, there is an appreciable difference.

DR. SIESS: From what I read and understood, there is not an appreciable difference in that area. TUV covers more areas, I am not quite sure how many more they cover than we cover by the code. They cover concrete construction.

DR. CARBON: TUV I'm quite sure does.

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MR. BENDER: It varies state by state, but they do have a broader coverage of pressure vessels.

DR. SIESS: Within the range of the pressure vessel code, I don't think there is much different. Are they, Mike?

MR. BENDER: They are quite parallel.

DR. MATTSON: That's our understanding also.

MR. BENDER: Because they extend in other areas, they do carry that same authority. It is more like a building inspector really, some combination of that.

DR. SIESS: Most building inspectors don't do a tenth of what TUV does.

MR. BENDER: But some places they do, you know that. It varies some.

DR. SIESS: On any of the construction jobs you hire quote an independent testing laboratory to do certain things. Whether they are independent or not depends on how you look at it. They are paid by the contractor, and people sometimes say they are not independent. I don't know if they would be more independent if they were paid by the NRC.

MR. JORDAN: I am perceiving something from the ACRS that maybe we ought to try to clarify in terms of the inspection staff.

When I talk about an inspector at a site, we do have a resident inspector at these sites, as I have described. And he covers a number of disciplines, but primarily the

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general inspection elements. And all inspection programs and at all sites we have specialists who perform inspections of those specialty areas. So that we have inspectors who are very highly qualified.

They have industrial experience. They have been trained in the particular ACI codes. They do concrete inspections but don't do electrical inspections, don't do mechanical inspections, but concrete. We have welding engineers.

So I want to make sure that I haven't misled you and said that the generalist does everything at a given site. At a given reactor operating site, I would say at least a dozen different inspectors go to that site during a given year.

Okay. The next question was with regard to the depth of knowledge that the NRC Staff should have in areas of construction, hardware, plant behavior, operations, and maintenance.

I have assumed that in terms of the I&E inspector in this case, so my answer is that reactor inspectors who review licensees' activities in areas identified in the question are required to be qualified to perform inspections in a given technical area.

In addition to the job description-type skills and knowledge requirements, each inspector must attend and successfully complete technical courses in his specialty area, or complete an equivalency exam in the course of being

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assigned responsibility for performing inspections in that area.

Satisfactory completion of the course requires passing a written examination at the end of the course.

Qualification of an inspector for a given area is performed by regional evaluation, in addition to the training program.

So we have an on-the-job-type training program where he accompanies other inspectors in the specialty area. He attends the I&E training course and then he is evaluated by his regional supervision, and judged qualified when he has achieved the level of qualification required.

Typically, a qualified reactor operations inspector will have reactor operating experience. That was, I think, one of the questions someone asked earlier. That is what we would consider to be necessary as part of his job skills before being hired for that particular job.

He will also have attended subsequent to being hired a reactor systems course, a simulator course, and then an advanced systems course. Subsequent to that, he will be attending an inspector effectiveness-type training course on his inspection skills. Not technical skills, but purely how to communicate with the licensee, how to write reports, how to document noncompliance, those inspector skills.

The inspectors are typically graduate engineers with

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5 to 10 years industry experience or nuclear Navy experience. The same level of qualification and training is required for construction inspectors, engineering support inspectors, security and radiation protection inspectors.

So that is a very capsuled description of the qualifications.

MR. BENDER: Let me pursue that matter a little bit.

I think that the thing that worried me is along the line that Mr. Etherington asked about earlier. How well would the inspector be able to evaluate, for example, testing of a controlled system that has to be looked at on a regular basis, or the diesel generators that have to be tested periodically?

Does he get some kind of an indoctrination into those aspects of operation that have such an important bearing on the operational safety of the plant?

MR. JORDAN: Insofar as seeing that we have a diesel generator training course, we don't.

MR. BENDER: The whole power system, emergency power, primary power, relay settings and things of that sort which have turned out to be one of the major problems.

MR. JORDAN: They have certainly turned out to be a trouble area.

MR. BENDER: I wonder how much we know about that aspect of the inspection and enforcement area?

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MR. JORDAN: Where it becomes a problem is that they are reviewed by electrical inspection specialists or an instrumentation specialist. And we have the qualified staff members to put into the problem. But as far as the generalist, it would be based on the training he has received and his experience to perceive a problem.

He is indeed out there to perceive a problem and then ask for the right discipline to help him if he perceives a problem.

MR. BENDER: I think you ought to look into that point, because my impression is that the kind of operator training that is given operators doesn't encompass that much, the operators business.

Some of us have been concerned that operators of the plants themselves don't have enough familiarity with the maintenance procedures to know the interaction. And I suspect this is the same thing that you should have expected.

MR. JORDAN: I certainly acknowledge your comment. I feel some level of comfort in acknowledging the inspections presently.

DR. CARBON: If there are no other immediate questions, I suggest we take a 10-minute break.

MR. JORDAN: I have got one more quickie presentation, and I will be done.

DR. CARBON: Either way. Go ahead.

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MR. JORDAN: The last one I have is the response to accident situations. And I picked up the following from Roger Mattson's comments. So all I am going to discuss are the changes that occurred with respect to the incident responses that are in the communications.

Certain changes have already been made in the communications area of the incident response as a result of the Three Mile Island experience.. These include manning of the Incident Response Center by a duty roster from the I&E headquarters technical staff.

And formerly, all of these offduty calls came into the appropriate regional office answering service and were then relayed from the answering service to a regional duty officer.

And if there was a significant problem at the site, the regional duty officer could then call the I&E headquarters answering service who would transfer the call to the appropriate headquarters duty officer.

Just describing it shows its stretch, and the distance from the two ends. So that the change is to install essentially a hotline from each reactor facility to the I&E headquarters office with the branch back to the regional office. This equipment has been procured and installed and is functioning and is tested on a daily basis presently.

The licensees have been instructed by bulletin and

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subsequent NRC letter to report significant incidents or accidents direct at the headquarters duty officer via this hotline. The headquarters duty officer would then communicate back to the regional duty officer who would not have 24-hour duty stations at all five regional offices plus the headquarters office.

That turned out to be a manpower circle. We did that for a couple of months after the TMI accident, and it is not practical.

In addition, a second separate telephone system is being installed. In each of these reactor sites, this will be primarily for communicating radiation detection and health physics of information in the event of an accident.

So that we have the dedicated hotline facility directly to the operations centers, so the operator picks up the line and he has got the duty officer.

And then separately, we have dedicated telephone lines at each facility which may then be used in an emergency and would not be tied up with the problems with some other usage, or would not be tracked through the plant management of the accident.

So those are the actions that we have presently taken. And, as with Roger, the major change is in our role. It will come after our investigation, after our review of lessons learned.

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end #9

DR. CARBON: Let's take a break.

(Brief recess.)

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DR. CARBON: Let's continue with the meeting. Wait, you have a question.

DR. LIPINSKI: Yes. Earlier you had said that you had planned 100 percent check on the emergency operating procedures. In the I&E inspection report on Three Mile Island, there are several potential items with non-compliance at the site, one of them being the test procedure for the auxiliary valves.

That was contrary to the tech spec, yet the safety review committee had signed off on it and it had not been picked up by inspection and enforcement prior to the accident.

With your new proposed structure, would you be able to pick up such a non-compliance beforehand?

MR. JORDAN: Once again I'll say that it certainly should improve the probability of it. I don't believe that anything is absolute and the program is going to continue to be a sample but of certain elements we're looking for. We would not be in series with the licensee and have to improve his procedure before he implements it.

DR. LIPINSKI: Because this is not an emergency procedure; this is only a test procedure. Consequently, it doesn't fall into your 100 percent check classification.

MR. JORDAN: That's correct.

DR. LIPINSKI: The other possible non-compliance you cite are failure to maintain records, failure to make

entries in the logs. And these are cited for the single incident.

Earlier, when Mattson was up, we discussed the correlation of plant performance with plant management capability. Do you propose to do any checking as to whether these occurred on a single incident or whether they're a repetition of plant management, in general, when they're not making their log entries or maintaining their entries for the five-year requirement.

MR. JORDAN: I understood that this meeting was to discuss in general terms rather than that specific case. We have people that conducted the investigations who can respond to that. I really can't.

DR. LIPINSKI: Okay.

DR. CARBON: Other questions of Ed?

(No response.)

DR. CARBON: I'd like to go back and ask Roger about three more, if I may. I don't know whether you covered it or not, but in terms of technical support groups for both normal and abnormal situations, is there any minimum size user organization that you have in mind that would be big enough to have an adequate support group and below which, perhaps, it wouldn't have the resource capabilities to have the kind of staff that it would need and that a small organization shouldn't be permitted to have?

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DR. MATTSON: What I said was we looked at the technical capabilities more for normal operations than for accidents. This is sort of a new concept. What is the minimum technical capability that should be available?

I think that from this study that the quality assurance branch is doing when they went out and solicited information on what utilities had, the intent is to characterize what's there and state minimum acceptance criteria for the future.

And it would be my projection that some utilities today do not meet what the minimum requirements were sho to be over the next several months. But I can't give you what that number is or what those disciplines are.

I would suspect that it will take some form of best practical technology, or something like that. They'll look at the better performing utilities, the people that seem to have done a better job in this regard, and they'll look at the utilities that seem not to be doing such a good job and decide how much in the right direction they want to move the ones that are in the wrong direction.

I would think that that kind of thing would probably take the form of a regulatory guide, or some vehicle like that that would get brought down here for your consideration. I don't think that we're far enough along to state in quantitative terms what we have in mind.

I think we've got to look at the kinds of disciplines that are necessary, look at the kinds of numbers that are required. You have to look at the proximity to the plant that you want in conjunction with the kind of communications that are available, to try to roll all those things up into a package.

DR. CARBON: A second question. I appreciate that you invited Byron Lee, and he's not here, of course. But I wonder, is there any comment that you can make with regard to the thinking of the industrial groups that you may be aware of insofar as -- well, I know that there are different groups with different outlooks. For example, the user organizations and the vendors. They have different viewpoints on many things and a small utility may have quite a different viewpoint on operator training or some such thing than a large organization like Commonwealth Edison or TVA.

Are there big differences in the viewpoints in the thinking of industry insofar as some of the lessons that are coming out of Three Mile Island are concerned? Is there anything you can say on that at this time?

DR. MATTSON: Only some very general observations that I guess are personal observations. I think there are two variables in the industry response. One variable is the size of the utility and its corporate resources and the other is level within a utility.

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I observed that higher levels of utility management -- let me say it another way -- the highest level of utility management seems to be of higher conviction that constructive change needs to occur and that larger utilities with larger corporate resources seem to be more convinced that constructive change needs to occur.

Now maybe that's an oversimplification. There are probably many exceptions to the rule. But as a general observation, I think I've seen those two trends over the past two months.

DR. CARBON: Still a third question: Within NRC, there was the question that was resolved sometime ago on dissenting viewpoints. And I think that that's well in hand. There are dissenting viewpoints in vendor organizations, too, obviously, and I would cite the difference of opinion in B&W about the significance of the Davis-Besse incident, and so on.

Are you planning anything or are you about to take any steps that would require users or vendors to call differences of opinion to your attention on significant technical matters that would necessitate their pointing out things before they become sure that there's a problem?

DR. MATTSON: I don't want what I'm about to say to be interpreted to apply to any specific situation that you or others may know of flowing from Three Mile Island. I'll

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say as a general matter that it's been my understanding, and I think a fairly widespread understanding, that part 21 was for many intents and purposes designed to accomplish some of the things that appear to be necessary, that maybe part 21 has not been sufficiently well stated or explained to accomplish that function, and it may need to be changed to do a better job.

It may also be the final opinion that part 21 isn't a good vehicle for assuring that and there ought to be some other vehicle.

MR. BENDER: I don't think I've ever read it.

DR. MATTSON: Well, part 21 basically says that if corporate management at any level becomes one of the safety problems required under the law, to report it to the NRC within a certain time limit.

There are hookers in all of these things which are the difficulty of defining when you think you've got a safety problem.

Clearly, you don't want every question that comes along in a good engineer's mind to trigger some bureaucratic machinery that interferes with the day-to-day solution of problems.

On the other hand, you clearly don't want good ideas on safety problems to be buried in engineering organizations forever without giving time and attention to the

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resolution.

I'm not sure that part 21 has found the balance yet. I think we're seeing in recent months some initial attempts to follow through with part 21 investigations and see what they say. And if some sense of justice doesn't prevail from those investigations, then I suspect part 21 will be changed.

MR. BENDER: Part 21 applies to licensees, though.

DR. MATTSON: It applies to everyone who supplies also, including the widget manufacturer in South Podunk who provides sub-sub-sub-components -- its reach is quite extensive.

DR. LAWROSKI: Is that how it's interpreted?

DR. MATTSON: That's one of the difficulties of its interpretation, is how to make people at multiple tiers of supply aware of the responsibility -- Podunk -- and when they become aware of it, to keep them as suppliers.

(Laughter.)

DR. MATTSON: That's true.

DR. SIESS: It's been a problem. People wouldn't sell because of that.

DR. MATTSON: That's a complication. I think the fundamental issue is when do you decide that you've got a safety problem that would trigger the part 21 machinery? The problem is bigger, though. I'd enlarge it to not just

dissent and differing professional views within the design organization or an operations organization, but design quality assurance in general.

I think that there's room for significant improvement in design quality issues. Chet's comment earlier about, well, we know that there are difficulties with that sort and it shouldn't surprise us. I understand that, thinking also -- I think my opinion is that design QA needs better attention. Perhaps buried in that or as a part of that is this business of how you incorporate differing technical views in the design organization.

I think you were suggesting that perhaps there ought to be a mechanism where a dissenter and an NSSS supplier has a direct recourse to the NRC with protection or anonymity, or what have you.

I think that sort of protection exists already. And certainly, there are many examples elsewhere in government where such protection exists.

DR. LAWROSKI: And the lack of protection, too.

DR. MATTSON: I think that the recent court and federal findings in this area tend to support the protection of the individual quite a lot. Warren notes that TVA has established a corporate mechanism of this sort.

There's no coupling to the regulators.

I would suspect that NSSS suppliers and architect

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engineers moved by observation of recent experience, would probably be thinking in this area. I certainly would encourage it, having been through the experience ourselves. The learning is awful. Having learned, implementing the results is not so difficult at all.

DR. LAWROSKI: I don't think that maintaining anonymity is as easy as I think your statement implies.

DR. MATTSON: There have been several occasions in the course of the last year where I've been in my position and people have brought to the attention of folks who work for me difficulties they've perceived in various organizations around the country, and we rather routinely referred those to I&E and saw that they were followed up on without large difficulties accruing to the people who brought them up.

Certainly, in a couple instances, important things were discussed, talked about, fixed, whatever.

DR. LAWROSKI: I know that that's what the rules of the game say.

DR. CARBON: Gentlemen, are there any other questions to raise of staff? Anything else to bring up?

(No response.)

DR. CARBON: Are we at the point of adjournment?

DR. SIESS: Max, there was one mechanism of simply an anonymous letter to the ACRS that worked pretty effectively in the past.

DR. MATTSON: An anonymous letter to almost anybody --

DR. SIESS: The ACRS is fairly sure to air these questions if they get them. I'm not sure how fast they're acted upon.

DR. MATTSON: Anonymous letters to the NRC are acted upon very quickly. Within days there's usually somebody beating the story down to its roots.

PROF. KERR: If the ACRS really wants to get action, it should send its letters anonymously.

(Laughter.)

DR. SIESS: Thank you, Bill.

DR. MATTSON: I think maybe that's a good note to quit on.

DR. CARBON: I'd say an excellent note. I guess the meeting's adjourned. Thank you, gentlemen.

(Whereupon, at 5:00 p.m., the hearing was adjourned.)