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NUCLEAR REGULATORY COMMISSION

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BRIEFING ON EMERGING TECHNICAL ISSUES

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PUBLIC MEETING

Nuclear Regulatory Commission
One White Flint North
Rockville, Maryland

Wednesday, October 25, 1989

The Commission met in open session, pursuant to notice, at 10:00 a.m., Kenneth M. Carr, Chairman, presiding.

COMMISSIONERS PRESENT:

KENNETH M. CARR, Chairman of the Commission
THOMAS M. ROBERTS, Commissioner
JAMES R. CURTISS, Commissioner

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STAFF SEATED AT THE COMMISSION TABLE:

SAMUEL J. CHILK, Secretary

WILLIAM C. PARLER, General Counsel

JAMES TAYLOR, Acting Executive Director for Operations

THOMAS MURLEY, NRR

FRANK MIRAGLIA, NRR

FRANK CONGEL, NRR

BRIAN GRIMES, NRR

P-R-O-C-E-E-D-I-N-G-S

10:00 a.m.

CHAIRMAN CARR: Good morning, ladies and gentlemen.

Commissioner Rogers is on official travel and will not be with us today.

The purpose of this morning's meeting is for the NRC staff to brief the Commission on the status of certain emerging technical issues for operating reactors. I understand that the staff will be discussing the six generally unrelated issues of stress corrosion of Inconel 600 alloys; temporary non-code repair of piping; in-service testing; corrosion of steel containments; electric distribution system weaknesses; and interfacing systems LOCA.

I ask that during your briefing you make it clear on which subjects you will be seeking Commission guidance, where rules and regulations may need to be modified, and what impact your planned actions will have on NRC staff resources and when the necessary actions will be completed.

Copies of the presentation slides are available at the entrance to the meeting room.

Do any of my fellow Commissioners have any opening remarks?

If not, Mr. Taylor, you can proceed.

MR. TAYLOR: Good morning, sir. With me at the table this morning, to my right, Tom Murley, all here at the table from NRR. Brian Grimes to his right. To my left, Frank Miraglia and Frank Congel.

This is basically a briefing by NRR, but I would like to mention that other offices in the Agency certainly do contribute to identifying emerging technical issues, particularly AEOD and Research. And our example -- maybe not in this immediate package, but certainly through the work of the offices and particularly those offices, issues are identified which are important technical issues, without mentioning examples. But I did want to mention that to the Commission.

I would like to mention to the Commission too, and perhaps this -- and I'll let Doctor Murley and the staff try to respond to your questions -- but these were selected really as issues that are in the process of being understood, developed, reviewed in a number of cases. I think generally, and I'll let Tom and the others address it, are not yet at what I call the stage of resolution. But the staff did want to tell you of these issues because they are important and they are issues that the staff's working on and tend, one way or the other, to bring resolution. Resolution may be not a need for a rule or a need for regulatory action. And then, again, it may result in that. But I'll let the staff pick up on that.

Tom? Tom Murley.

DOCTOR MURLEY: Thank you, Mr. Chairman, Commissioners. It's usually when we're here briefing the Commission it's after an issue has been well formed and debated and options are presented and so forth. We're here today to tell you of some things that are in the early stages of discussion and we may, in fact, decide that we need to do nothing on these as we get into them.

There is a major effort, major staff effort that we do that also doesn't get normal Commission briefing and visibility and that is our effort in NRR on operations and events assessment. But it is quite large. For example, we look at 5,000 events per year, are screened by the staff. That's 100 a week, for example. Of those, we follow-up on about 1,000 of them and track them. Of those, they ultimately lead to generally 100 generic communications per year. These are rough figures. So that gives you the magnitude of the type of effort that goes into that.

As the process of screening those events and following them, we do notice patterns from time to time and we do notice where operating experience tells us that maybe there's a safety issue that we haven't looked at before.

What we're going to talk to you today then is about some issues that we chose that we're working on that we think are worthwhile to tell you about early. A couple of them are forms of aging degradation that are just simply revealed by wear and tear of the plants. One of them, or a couple of them I should say, are procedural upgrades that experience has told us are needed. One of them is where a pattern of equipment failures and human failures has raised a question as to whether a particular accident sequence might be more likely and that pose a larger risk than we otherwise would have thought.

So, without anymore introduction, let me turn to Frank Miraglia who will lead into some of these topics also.

MR. MIRAGLIA: Thank you, Tom.

Good morning, Commissioners.

As Tom and Jim have said, the operating experience and inspection results are a source of identifying potential generic concerns to the staff. As has been indicated, some of these issues are better understood. We've looked at them longer. Sometimes operating experience and inspection results reveal things. They ask us to go back and relook at things that we had looked at in the past.

Not all of the management reviews have been done on these issues and some are truly in an embryonic stage of development. We've chosen these issues based upon -- sometimes some of this material has been talked about in the press, some of these issues, in trade magazines, in the trade press and we thought it would be of interest to the Commission to indicate where we're going and where our thinking is, and other issues you've heard about in other related activities.

With that, I'm going to discuss the four engineering issues on the agenda today. Mr. Richardson, our Director of Division of Engineering, was unable to be with us because of a death in the family.

The first issue that we're going to talk about is the stress corrosion cracking of Inconel alloys. This has revealed itself most recently in operating experience at Calvert Cliffs with respect to some leaks at the pressurizer heater assemblies on Calvert Cliffs Unit 2.

Inconel 600 has long been known to be susceptible to primary water stress corrosion cracking or pure water stress corrosion cracking. We've noted this kind of corrosion in Inconel alloys in other reactors. BWR reactors had significant cracking in recirc. systems several years ago.

As we currently understand the Calvert Cliffs situation, it appears to us at this time that the stress corrosion cracking is caused by the manufacturing processes that we use to manufacture the pressurizer heater tubes. These tubes were cold worked. They were reamed out in order to be able to accommodate the heater tubes and as a result the stress corrosion cracking that we have been seeing is axial. This is consistent with the process. They're axial cracks and since they're axial cracks we do not consider them to be a large safety concern. However, it does indicate a need for perhaps augmented in-service testing and inspection.

Because of our previous experience with Inconel 600 and what we've seen here, we've been working with the CE owner's group to develop whether there's similar pressurizer heater tubes fabricated in a similar manner in other plants. Our current thinking along these lines is as the information develops, we may need to develop generic communication in the form of a bulletin. We've already issued an information -- a generic communication on an information notice informing the industry -- but a bulletin that might indicate a need for augmented in-service inspection at susceptible locations that have these fabrication histories.

CHAIRMAN CARR: We know who made them, the tubes?

MR. MIRAGLIA: These, the ones at Calvert Cliffs, I believe, were made and fabricated by Combustion Engineering. The fabrication records and the history on lots of the components perhaps is not always clear, the traceability all the way back to the source as to where the material -- what kind of working and fabrication history it has. So, it does make it a difficult kind of thing.

COMMISSIONER CURTISS: Is there any evidence of circumferential cracking of the tubes that you've seen?

MR. MIRAGLIA: Not on the Calvert Cliffs situation. Now, there is foreign experience that indicates that they are also seeing stress corrosion cracking in steam generator tubes. That is circumferential and that's because of how the tubes were fabricated again. It's a rolling kind of fabrication and therefore the picture -- the fabrication technique coupled with the pure water sets the environment that you get the corrosion after the fact. In that case it results in circumferential cracking. In the cases that we've seen here at Calvert Cliffs, it's axial cracking and that's why it's of a lesser concern.

COMMISSIONER CURTISS: With what you've seen, would you expect the axial cracks to propagate into circumferential cracks or is that a logical result?

MR. MIRAGLIA: I think the answer to that question would be no, Commissioner, not at this time. But it is something that would leak and cause operational kinds of concerns. Therefore, we would probably need to assure and augment the testing.

CHAIRMAN CARR: A stress riser is one part of the problem, but assuming there's no stresses around, does this lend itself to chemical treatment to get rid of the pure water stress corrosion cracking or who's doing research on that kind of thing?

MR. MIRAGLIA: I could let me staff answer that one. I think you need several environments. You need the pure water and the stress. I think if you reduce the stress, that would take care of a significant contributor.

C.Y., would you like to comment further on that?

CHAIRMAN CARR: Would you tell the recorder who you are in the microphone?

MR. CHEN: My name is C.Y. Chen. I'm the Chief of Material and Chemical Engineering Branch.

Regarding the research on the Inconel 600, I guess we have some program in the Research Office doing this kind of work. But as you know, the IGACC has come from those three ingredients, high residual tensile strengths and the susceptible material now that we have Inconel 600, and then the environment. The combination of those three factors will affect whether the IGACC will go or not.

Now earlier, Commissioner Curtiss asked about circumferential or axial crack. You know that internal stress, an axial crack will normally happen first because the stress is twice as much in axial stress. So you will develop axial stress first. But depending on the environment and the loading conditions, it could change into circumferential. In the steam generator case, we did see the circumferential crack instead of axial.

But the axial crack in this case is limited to the zone of the work in the cold work. That's why it's not too lo... and our judgment is it's not a safety problem. Mostly, 't's an operational problem.

MR. TAYLOR: The bottom line, I guess, is that the cracking pattern matches the cold work pattern. That's what you're seeing in both steam generator tubes. It's the cold work method where the stress risers and --

COMMISSIONER CURTISS: The problem has cropped up over in the French plants. Does that square with the conclusion that they're reaching over there as well?

MR. MIRAGLIA: Yes, they have cold weld tubes. It's the low tubes and so they're experiencing this. We are going to be visiting France next month and we hope to discuss some of that with them next month.

COMMISSIONER ROBERTS: What are you talking about, the actual manufacture of the tubes or rolling the tube into the tube sheet?

MR. MIRAGLIA: In the case of the Calvert Cliffs situation, these tubes needed to be reamed out so they can accommodate the pressurizer heaters. So there's actually cold working of a short end to ream that tube out to have the sufficient diameter to accept the heat. So, each unique application perhaps would add the ingredient of stress. As C.Y. has indicated, you need three ingredients

DOCTOR MURLEY: The foreign example was, I believe, rolling the tubes in the tube sheet.

COMMISSIONER ROBERTS: All right.

COMMISSIONER CURTISS: One other quick question on that. Do we have Inconel 600 in any other primary systems that we ought to be taking a look at or is there any reason to do that at this point?

MR. MIRAGLIA: Yes. As I indicated, we have seen this kind of thing in the BWRs. We had some recirculation safe ends piping and we've taken action on those in the past. What this new experience does is essentially confirm the fact that Inconel 600 is a susceptible material and given stress and given the right environment will be subject to this kind of corrosion. So, we need to be sensitive that the material is used in an application that there is sufficient testing to identify leakage.

COMMISSIONER CURTISS: Is that material widely used on the primary side?

MR. MIRAGLIA: Yes, I would say yes.

COMMISSIONER CURTISS: Okay.

CHAIRMAN CARR: I guess my concern was that the chemists work on the problem and see if they can minimize the problem because you're going to have stress. You can't get rid of that.

MR. MIRAGLIA: They've gone to different alloys and Inconel 700 -- there's a 690, I believe, to address the --

CHAIRMAN CARR: That's metallurgists. I'm worried about the guys who can put something in the primary system that might tend to knock this effect down. We've done something like that, I think, with stress chloride.

MR. MIRAGLIA: Yes, and the environment here is -- the chemistry environment is such that it's low oxygen, which the primary is kept purposely low, at low oxygen, and that the significant contributors are the susceptible material and the stress.

CHAIRMAN CARR: Okay. Let's proceed.

MR. MIRAGLIA: The next area has to do with temporary non-code repairs of ASME piping. The ASME code requires any repairs to code piping to meet certain requirements and be done promptly. We have endorsed the ASME code and the code is used and committed to by various licensees for Class 1 and 2 as well as Class 3 piping.

Because of the requirement of having to do code repairs, this could lead to shutdowns to effect code repairs. There are certain piping systems within the plant that are subject to code where a plant shutdown may not really be necessary for a limited period of time if certain criteria are met.

The staff is developing a position on the acceptability of certain temporary non-code repairs and the purpose of this position will be to provide guidance on when these non-code repairs could be permitted without actually having to come in and receiving a relief request from the permitting authority, which is the NRC. Any time there's deviations from the code that they've committed to, the code provides for certain kinds of relief. Those reliefs have to come in. This is a procedural kind of issue. We've seen -- we have granted these reliefs on a case by case specific basis.

Some utilities are more sensitive to these things and actually come to use and seek relief. We've also found some instances in our inspection process where the utilities have perhaps done a non-code repair and not gotten the appropriate types of relief and then had to take enforcement actions and issue notices of violation.

As a result of this type of experience to clean up the procedures, Class 3 piping, we feel we can issue non-code repair reliefs if it meets certain criteria and the criteria would be that they have to assess what the floor characteristics are, do a sufficient inspection of the piping that's involved to assure that the defects aren't located elsewhere in the piping. They could effect a non-code repair to continue operation.

Now, this is for Class 3 piping only. We've decided that this is the only place we would give this generic relief according to the criteria. If they meet that criteria, they could effect a non-code repair until the next shutdown or duration sufficient to repair the piping and return it to code requirements. This year it will be issued in the form of a generic letter. It would go through the processes of the CRGR review and be issued as a generic communication. I don't believe this would entail any action by the Commission.

CHAIRMAN CARR: Will they notify us when they do it, even though they don't have to get permission?

MR. MIRAGLIA: They would have to keep records of what they've done on-site similar to a

50.59 process.

CHAIRMAN CARR: They wouldn't notify us, but we could inspect them.

MR. MIRAGLIA: Yes.

CHAIRMAN CARR: Would we require them to make periodic inspections until they do the permanent repair?

MR. MIRAGLIA: The criteria is such that in order for them to effect this non-code repair they would have to do sufficient inspection and an analysis of the flaws to say that they could operate over the intended period of time.

CHAIRMAN CARR: That's pre-repair?

MR. MIRAGLIA: That's right, and that would get them -- it's a very short-term -- it's an interim duration. At that next shutdown, they would have to repair it.

CHAIRMAN CARR: If it's a long enough shutdown, the way I read it.

MR. MIRAGLIA: That's correct.

CHAIRMAN CARR: That means they could operate, certainly, between refuelings perhaps.

MR. MIRAGLIA: As long as they're refueling, yes.

CHAIRMAN CARR: And would we not require any increased inspection of that repaired area between those times?

MR. MIRAGLIA: I think we would have augmented inspection of that, leak detection in that period of time.

No further questions?

General design criteria, criterion 1, states that structure systems and components important to safety shall be tested commensurate with their importance to safety. We've incorporated in our regulations under Part 50.55(a) ASME boiler and pressure code requirements. We have concerns that the implementation of these regulations for the operating power plants are perhaps not sufficient enough to go far enough to provide the necessary assurance that pumps and valves in the power plants and safety-related and important to safety systems are being tested sufficiently to identify that their safety functions are being carried out.

The staff has a long-term effort underway. We have issued a number of generic letters. We have issued an in-service testing and generic letter where we've clarified what our views and positions are with respect to reliefs to in-service testing. That generic letter was issued, I believe, late summer or early fall, maybe it was even earlier.

And I guess this fall we issued the motor operated valve. Again, I'm concerned about the operability and testing of safety-related valves.

There were previous generic letters stemming back to '86 that came out of the Davis-Besse event.

There are other generic issues that were identified and being worked on, and we have a program that includes all of these facets and the culmination of which would be in a revised in-service testing rule.

We are working with Research -- and this is an early example -- we are initiating a rulemaking request. This is something that's being worked at the staff level right now and hasn't gone up through the management chain. We're working with Research to develop an in-service testing rulemaking, and there would be several changes to the regulations that we are contemplating. What the final package looks like remains to be seen. This is one that's still under development.

We would clearly want the new rule to indicate the scope of an IST program. As currently interpreted and defined, it clearly gets and captures ASME code class components. However, there are pumps and valves out there that may not be of code class that are important to safety and perform safety-related functions that require in-service testing, so we want to make sure the scope of the rule is broad enough.

Another change is we would reference the ASME Part 6 and 10 of the Operation and Maintenance Standards that the ASME has developed. We think that this is an improvement and a step in the right direction, and so we would incorporate those new standards within the regulation. That would require a rule change.

CHAIRMAN CARR: Let me ask, if you've had work shops on this, what kind of feedback are you getting?

MR. MIRAGLIA: We've had a number of workshops on the MOVs, and we also had an IST symposium. Ted Marsh has been involved in those, and maybe I would ask Ted to address what our experience has been with those.

MR. MARSH: My name is Ted Marsh, the Chief of the Mechanical Engineering Branch.

This summer we had a symposium in downtown Washington where we discussed a number of IST-related issues, pumps and valve testing standards. We had a good feedback from that meeting. There was an excellent exchange of information. The industry is generally very receptive to occasions where you exchange information of this sort and it hasn't happened before in the IST area. So, it was very well received. We've gotten a number of issues we think need to be worked on, we've taken them to the code and they have progressed. So, they work and we work on those issues.

CHAIRMAN CARR: Did the workshop turn up utilities who were doing testing beyond that required by the NRC or the ASME?

MR. MARSH: Yes, there are utilities that do that. There are several plants that take the IST requirements to heart and go beyond, apply the IST criteria to systems that aren't Class 1, 2 and 3 and do beyond what is necessary. Those are model utilities and we've brought those up to the code as examples of plants that can do better and have and we should model the standards after those.

CHAIRMAN CARR: Thank you. Commendable.

COMMISSIONER CURTISS: Do we currently require MOV AT testing on secondary valves or is that a matter of discretion for the utilities?

MR. MIRAGLIA: I think that the question as constructed is difficult to answer. We have modified the MOV letter to indicate valves that would be in the secondary system, yes.

MR. MARSH: We don't require MOV ATs, per se. We require some testing of some sort. The latest generic letter, 89-10, say, "These are the valves that should be tested, the system that should be tested. Beyond that, we think it's prudent. We think you should do that and we will look to see how you, in fact, do your testing when we come and do an inspection, but we don't require it at this point in time."

COMMISSIONER CURTISS: At this point we've identified all the valves on both the primary and the secondary side that we think are important --

MR. MIRAGLIA: That need to be tested. We didn't specify MOV ATs.

COMMISSIONER CURTISS: And there are some utilities, I gather, that are going beyond that?

MR. MARSH: Yes, sir, there are plants that are doing that.

COMMISSIONER CURTISS: Okay.

MR. MIRAGLIA: In addition, since the rule change is a longer term project and it's really in the development stage, we've also felt that we need to work with AEOD and Research to say what's coming out of the research programs and the study of the trends in operational data to say, what are the material pumps and valves that ought to be covered in this kind of rulemaking?

As I indicated, this is just being initiated. We haven't even put the memorandum together to say what all the elements are and we're in the process of doing that. So, I would say that this is something the Commission would see on its agenda, but not in the immediate future.

Corrosion of steel containments. In recent years, most recently I guess it was early this summer, we saw corrosion on steel containments in the PWR ice condense plant at McGuire. What had happened there, there was some puddling of water and there was actually corrosion of the steel shell and it had to be examined to determine whether it met code requirements.

Similarly, the BWR drywells were first detected corrosion was at Oyster Creek where, because of some pooling of moisture in a sand cushion area based on a UT inspection of the drywell, they saw a reduced wall thickness and determined that corrosion was occurring and had to take corrective actions.

We've seen the steel of the torus at Nine Mile also, during an in-service test inspection, experience several areas of thickness that had corroded away. As a result of these, we've conducted a number of surveys and have identified certain degradation mechanisms. Some of them are because of water pooling. Some are coatings that were not applied initially or had been improperly applied. So we're examining each of these as they occur.

For the drywell corrosion and the torus corrosion, we have issued information notices about what we found, how they were detected and what the root cause was. The ice condenser steel containment, we're preparing such an information notice.

With respect to the boiling water reactors, we are working with the owner's group to look at and formulate perhaps an augmented in-service inspection program. Given this experience that we've seen at a number of reactors, given the circumstances, what type of augmented in-service inspection program might be appropriate to deal with this kind of issue and we're working with the owner's group in this regard. I guess we would similarly work with the other owners to address the issues on the ice condense plants.

COMMISSIONER CURTISS: In a case like Nine

Mile where you get torus wall thinning that comes down pretty low, I take it by what you said that you're looking at steps that can be taken to arrest the thinning. For the thinning that we're talking about here in these various systems, is there anything that can be done to repair or make up for the --

MR. MIRAGLIA: Yes.

COMMISSIONER CURTISS: Obviously you can't replace the torus, can you?

MR. MIRAGLIA: No, but you can -- for example, on the McGuire wall, I think they did do a weld repair and build the material back up and did it code -- effected a code repair.

COMMISSIONER CURTISS: Okay. That's something you can do on a torus wall?

MR. MIRAGLIA: Yes, in certain circumstances, or you can apply the coating.

COMMISSIONER CURTISS: Okay.

MR. MIRAGLIA: In addition, we're talking about, you understand, it's margin above. Minimum wall is what you meed.

COMMISSIONER CURTISS: Right.

MR. MIRAGLIA: So we're talking about degradation of a margin above.

DOCTOR MURLEY: I think it's important to keep this in the safety perspective that as long as it meets code, it still has margin of two to three times above design basis. What we're talking about is margin above the code even.

COMMISSIONER CURTISS: Right.

DOCTOR MURLEY: So it's not like these things are fragile little things that are going to fall apart.

MR. MIRAGLIA: And that's the case in these.

CHAIRMAN CARR: Is it the intent, then, to require the in-service inspection by generic letter or would you put that in the tech specs for those plants that are specifically vulnerable we know about?

MR. MIRAGLIA: I think what we have to do, Mr. Chairman, we determine the extent and that would indicate the generic communication. Most likely, it would be in the form of a generic letter. If it's limited to a certain set, we could even address the letter just to the select set. And again, that depends upon the experience that we find. We've done that and taken that approach in several others.

That completes the discussion of the engineering issues, and with that I'll turn it over to Brian Grimes to talk about the electrical distribution system.

MR. GRIMES: Brian Grimes, Director of the Division of Reactor Inspection and Safeguards.

This item's in the category of trying to learn from events in our inspection experience. Electrical distribution system weaknesses have been of increasing concern to the staff, and discussions at a recent senior management meeting suggested that perhaps this item should be pursued as an area of emphasis at all plants.

The issue here is the ability of the electrical distribution system to perform its functions under all the circumstances under which it might be required to perform. This includes supplying power to such things as pumps and valves, controlling this equipment, and protecting it from faults in the systems or failures, local failures.

The background, as indicated on the visual aid, is that we've identified in a number of instances uncontrolled load growth for both diesel generators and battery systems. That is, as people have found the need to make modifications, they've added loads to these emergency sources that might affect their operation if all the loads were required to be supplied at once.

Another item of experience is incorrect set points for protective relays that could affect the availability of both safety trains in some circumstances. If you reached another voltage or some other condition that tripped off both safety trains, you would lose for at least some period of time the ability to run key safety equipment.

Another piece of operational experience which gives us concern is recent events where we've had problems transferring loads in the switch yard between one source of power and another, which have caused on occasion loss of power to safety loads. I want to differentiate this from station black-out concerns, which are essentially related to the reliability of the diesel generators given a challenge o' loss of the off-site grid. Here, we're talking about the actual ability of the electrical distribution system itself to do the things that it's designed to do on paper. So, we're talking about an implementation problem.

Our experience base seems to be telling us that we should worry more about hidden original design errors and errors made in a modification process which could lead to common mode failures in this area, and we'll determine whether our concern is well-founded through some additional inspections that we plan to conduct.

There appear to be a number of contributing causes to these problems, including a lack of understanding of original design bases when changes are made; lack of available design documentation and configuration control; relatively weak engineering and technical support in some cases; and in some cases, an over-reliance on contractors by utilities. There's also been observed in the design process the interface problems between the engineering and operations groups.

(Slide) May I have the next slide, please?

We're developing a team inspection, which will assess the technical adequacy and the functionality of the system as it is installed in the plant. And this will tell us some things about the configuration control systems of the utilities and also about the adequacy of the utility technical and engineering support as it has worked on this system over the years.

We plan some pilot inspections over the next six months, and we'll then provide some training to region inspectors in addition to using them on the pilot inspections. The regions will be leading these inspections in the future, probably over about a two year period.

The teams will use region personnel, and also we'll provide contractor expertise. One of the key things we've found in this type of inspection, which is similar to an SSFI approach, is that detailed technical expertise is required to get to the bottom of these engineering problems and dig out the hidden problems that aren't seen until you really challenge the systems.

The staff resources which you asked about, Mr. Chairman, will be for the -- regional staff will be within the program that's laid out by NRR, and that will be considered the next area of emphasis after the maintenance team inspections. These team inspections will take over and use a similar level of resources.

Contractor resources we haven't entirely scoped at this point, because the pilot -- it will take the pilot inspections to exactly size the teams and the length of time that we'll require, but we expect to be able to use our technical assistance resources for these -- to supplement these inspections.

DOCTOR MURLEY: Let me add a point to what Brian just said, just to recap. You know, our inspection program consists roughly of one-third of a core inspection program that all plants get, emergency preparedness, health physics, and that sort of thing.

One-third of the resources is allocated for discretionary inspections for the regional administrator to just react to events and send his own teams out.

Another third, the final third, is aimed at this special area of emphasis. We've done emergency operating procedures. We've done maintenance. And in fact, this came up at our senior management meeting the last time. One of the regional administrators recommended that the electrical systems be the next area of special emphasis. We thought that was a good idea. We looked at two or three areas and we scoped this one out, and Brian just mentioned that this will probably start next year sometime.

MR. GRIMES: We're going to do some pilot inspections this winter and spring and some next year some time.

DOCTOR MURLEY: So I think this is a good example of how the system's working and regional people --

CHAIRMAN CARR: Doesn't this problem really lend itself to testing? Can't you just go out and do a selective trip test? Tell them, "Okay, drop it and see what picks up and what don't. See if you can carry it."

MR. GRIMES: The problem is loading all the equipment in the manner that it would be loaded in terms of pumps running under the appropriate conditions.

CHAIRMAN CARR: That's where I'm talking about testing it.

DOCTOR MURLEY: That's one way of doing it. You'd have to run a fairly extensive test situation to get the -- all the overloads showing up.

CHAIRMAN CARR: If that's the end of a cycle and they're ready to shut down and everything's running, it seems like you could get this data practically.

MR. GRIMES: Well, you have to remember the systems are also designed to take a single failure in any part of the system, and there's a large -- a number of these things that could be postulated. We found it's very tough to simulate by test all the conditions that you would get in an accident.

CHAIRMAN CARR: But you're going to have to do a design analysis of everything they've done in the electrical system to really accomplish what you want to do here.

MR. GRIMES: On a sampling basis, we'll have to hit a lot of different attributes.

CHAIRMAN CARR: I think what worries me most is the people who have made an authorized change to a set point in one part of the system without looking at the reflection throughout the whole electrical system, and over a period of years that happens or they add a load, as you say. But if you don't have that probably controlled at the time or the design control in order to come in at this point in time and try to see what the situation is, you're really going to have to do a heck of a lot of work.

MR. MIRAGLIA: One thing we have done, Mr. Chairman, that would address in part your concern is that the way these things manifest themselves are through operating trips --

CHAIRMAN CARR: Sure. That's how you find out.

MR. MIRAGLIA: -- and that's how we found some of these ground breaker coordination problem and the like that Brian has described. What we've done also in setting up this inspection module is to go back and look a precursor events and electrical events to say which ones were significant precursors to more serious kinds of -- what systems should we concentrate on? I think we have that as input to developing this thing.

You might want to indicate some of the areas that we're going to be concentrating on as a result of looking at the precursors and events, what systems are important, how close did we come in certain circumstances and to look for those kinds of vulnerabilities, plus the operating experience. This is one program that we're working with the regions and AEOD and Research to try and pull --

CHAIRMAN CARR: Oh, I applaud the program. I think it's very important.

MR. MIRAGLIA: -- all these kinds of things to get the focus that it needs.

CHAIRMAN CARR: It's a very important thing and needs to be done. I'm just trying to figure out the easiest way to do it.

MR. TAYLOR: May I? The solution will come through the utilities themselves looking at the plant as configured design. There are a couple of cases where people -- the utility, I won't mention the plants, but they've had enough experience with difficulties in this area that they've said, "Enough is enough. We're going to go back and do a rather exhaustive review." We're happy to see that.

CHAIRMAN CARR: It looks to me like they're going to have to do this anyway as part of the blackout rule and their coping analysis, unless they just decide to add diesel generators.

DOCTOR MURLEY: I think we're going to be looking deeper and we're going to be looking out in the switch yard more than they might do as part of their coping analysis.

MR. MIRAGLIA: As Brian indicated, this goes a little beyond the station blackout assumes that the electrical systems that are out there will perform as designed when experience is showing that's not always the case.

CHAIRMAN CARR: In the construction testing phase, don't they do a selective tripping test when they get all these things lined up and set up? How long does that take?

MR. GRIMES: In terms of preparing for it, I guess you have to set up all procedures. It's a fairly instantaneous --

CHAIRMAN CARR: Well, I'm just thinking if we filled out that same test and said, "Hey, it's time to rerun that thing. We don't know what we've done to the electrical system." Is that not a reasonable --

MR. GRIMES: I would say that wouldn't give us the level of confidence we're looking for. I think what we'll find by sampling is some plants we won't find many problems and we'll get some added degree of confidence. If we do find some significant problems, then it's going to be up to the utility then to pursue with substantial additional resources some really in-depth --

MR. TAYLOR: Review and testing.

MR. GRIMES: -- reviewing and testing.

CHAIRMAN CARR: Well, I don't get the same level of confidence from a paper review that I do of actually going out and throwing a switch.

DOCTOR MURLEY: Mr. Chairman, in order to test these under the --

CHAIRMAN CARR: I can imagine they'll all want not to do it, I'm sure.

DOCTOR MURLEY: -- circumstances that you'll want these to operate, where all the safety systems coming on, you've got certain things failed, I would get very nervous of running tests that you don't have to run.

CHAIRMAN CARR: Well, most of these things occur in a normally operating plant as a result of some kind of a shutdown.

DOCTOR MURLEY: But there may be some

weaknesses though that don't show up until the emergency diesel is fully loaded, let's say, with all the safety trains on that would normally be on it, plus some additional failures. That is under real accident conditions. I guess the thing that would make me pause is I don't know how close you want to go to stage that kind of a test.

CHAIRMAN CARR: I don't either.

DOCTOR MURLEY: Because we've seen cases where we induced a station blackout during a test like this and it's a little bit like pulling your begonias up by the roots to see how the plant's doing.

CHAIRMAN CARR: I am well aware of that.

COMMISSIONER CURTISS: How many plants do you have in your pilot program and how are you selecting those?

MR. GRIMES: We're just scoping that right now and we're going to select those based on where the regions tell us they would like to have a little more priority in terms of looking at electrical systems. So, we'll be talking to the regions about where we ought to go with these pilot programs.

CHAIRMAN CARR: Where they've had a history of problems, certainly.

COMMISSIONER CURTISS: I guess one of the things you could do to get at the Chairman's problem is take a plant where you know that the system's been overloaded or where you've identified changes in the set points and come up with the most sophisticated simulated test. I think Tom's point is a good one about testing systems that might lead to other problems. But if you wanted to get at that, you could come up with the most sophisticated simulated test you could envision and see if it ferrets out the problems that you know to exist in the plant.

MR. GRIMES: We'll certainly look at that. My experience is that the test that I've seen don't really get to all the things that need to --

COMMISSIONER CURTISS: One other quick question on the schedule. Is it envisioned that after the six month pilot program, that you would complete these inspections at all the plants within a two year period after that?

MR. MIRAGLIA: What our current thinking would be is to handle it similarly to what we've done in the maintenance team inspection. They wouldn't start until the maintenance team inspections are completed, and those are scheduled to go a little beyond the start of fiscal '91. Our initial plan would be to do all the plants, but I think what we've done, as we've done in the maintenance team inspections, after we've done some should we change the inspection techrique, the scope or the depth? We'd have to assess that and that would be an ongoing activity.

COMMISSIONER CURTISS: So we're looking at FY '93 or '94 to complete the tests?

MR. MIRAGLIA: We're looking at the start of FY '93 going through '93, potentially into early '94.

COMMISSIONER CURTISS: Okay.

CHAIRMAN CARR: And you're still working on the criteria for the inspectors then?

MR. MIRAGLIA: Yes. This is a very early development.

MR. TAYLOR: This is a subset really of the configuration and design control function process where --

CHAIRMAN CARR: And maintenance.

MR. TAYLOR: Right, and where you find problems and you can make the case with the industry. The best thing that happens is they get their own programs going to help alleviate conditions as necessary. They go back into their own plant and review.

We've had numbers of cases where this has happened. As I mentioned, a couple of plants where they have, by an event and what happened during the event, they've gone back and detected the overloaded bus, maybe DC bus or AC safety bus. They've immediately recognized the condition they've gotten into. So they rapidly go through a big review. I'm sure that they've -- you know, it just isn't one case. So, that's the type of thing you hope this type of work will generate.

CHAIRMAN CARR: Okay. Let's proceed.

MR. GRIMES: Yes. The next item is -- Frank Congel will have it.

MR. CONGEL: Good morning. My name is Frank Congel. I'm Director of the Division of Radiation Protection and Emergency Preparedness. This morning I'd like to give you a brief discussion on the status of their interfacing systems LOCA issue.

The first thing I believe we should do is describe what an interfacing systems LOCA is. During normal reactor operation at power, there are systems isolated from the primary system by virtue of valve, valves or a series of manually or motor-operated valves and check valves.

An interfacing system LOCA can occur when the barrier that separates out the operating system at power from the subsystems that are designed to operate at lower pressures is breached. The special problem with this kind of a LOCA is that if it occurs, it generally introduces primary coolant outside of the containment so that you actually have breaching of two barriers essentially at the same time.

The problem itself is not new. It was studied extensively by the Reactor Safety Study WASH 1400 and placed in the perspective with other loss of coolant accidents. And in fact had not attracted much attention since then because based on probablistic risk assessment the issue did not show up very high numerically. To put it in perspective, it is in the order of 10^{-6} type of event.

However, in recent times as a result of primarily our looking at event reports, as Tom pointed out earlier during the introduction, there are some things that occurred both with foreign as well as domestic reactors that indicated there may be more to this particular event than just a simple or straightforward mathematical analysis in a PRA would indicate. In fact, the human aspect is the one that could possibly increase the probability of this issue so that it may be significant.

I'd like to emphasize here and I will later on in my discussion that we have not concluded at this point that it is significant. We are looking into the event to determine if it is.

We have a program outlined to take a look at what precursors may exist and also the manner in which a number of various reactor facilities are operating. Based on a series of these kinds of audits and the evaluation of the licensing event reports, we plan to have a firm status of how we feel about this issue probably sometime next fall, about a year from now. Our target is like the fall of 1990.

But what are we doing right now in order to assess its significance? Well, we're looking at the recent events, as I mentioned, to understand what kind of error modes could lead to an ISLOCA. One of the things we found already and indications are that plant staffs are not very highly aware of this particular pathway. In fact, we found that in one of our recent audits, in fact our first audit under this program, that maintenance was being performed on two valves simultaneously in a system where if both of the valves were open we would have had an ISLOCA event. Now, once again, that did not occur, but the fact remained that the awareness at the plant staff level was not at such a point that a sensitivity to that pathway was recognized.

We finished our first audit. There is one coming up within the next week, week and a half for another sample plant. Depending upon the observations and conclusions of the audit team, we'll be planning more such visits to plants.

The emphasis at these audits is really in the area of human reliability and human engineering, although hardware systems are evaluated for integrity because this issue can, of course, spill over into the MOV issue. The primary issue that we're focusing on here is the human aspect and the effect of procedures on the human aspect.

At the same time, we're cooperating and interacting with our counterparts in the Office of Research. Our Research Office is involved in this project both in terms of systems analysis, piping integrity, accident management, which is another large program with which I'm sure you have familiarity. And our intent is, after doing careful evaluation of these components, is to pull together the results of these studies in the form of an updated PRA in this area along with an HRA, which is a human reliability assessment.

As I mentioned earlier, the technical

findings, I believe, will gain the position to be summarized by the fall of 1990.

That's my quick summary of the issue right now.

DOCTOR MURLEY: I think I should add, and it probably is obvious, but if we find any problems in these audits or any operational experience, we won't wait until the fall of '90. We'll take action if we have to. We haven't seen the need for that yet.

CHAIRMAN CARR: And it seems to me prudent in the design to have check valves in all those systems. Do they?

MR. CONGEL: Yes.

CHAIRMAN CARR: And so this is an outgrowth of our check valves not working problem?

MR. CONGEL: No, no, no, not just that. No, sir, because there are -- it's just one of the contributors. But, no, the systems are such that there are at least two valves that I'm aware of, of all the systems I'm aware of in series that do the isolation between the various systems that design for the high and the low pressure.

DOCTOR MURLEY: But they're not all check valves.

MR. MIRAGLIA: They're not all check valves.

MR. CONGEL: But they're not all check valves. That's right.

CHAIRMAN CARR: Because flow has got to go both ways, I assume, or otherwise they could put a stop check in it looks like. I mean -- well, we can look at that when we look at them.

It seems to me this problem also lends itself to computerization of the work process like the drug stores do when you get conflicting drugs. If you've got your work process in the computer and you start to take out two valves in the same system that would cause this problem, somebody -- something should raise a flag.

MR. CONGEL: That's one of the things that we'll be looking at.

CHAIRMAN CARR: Is this a cooperative effort with any other countries or is this just something we're looking at? Any other people got the problem or just us?

DOCTOR MURLEY: Well, we are going to be discussing this with other countries in our bilateral discussions with them about operating experience. But right now, this program is just a U.S. program.

CHAIRMAN CARR: We're still doing an analysis, I guess, of have we got a problem or haven't we?

MR. TAYLOR: Right. We're trying to understand the size of it.

MR. TAYLOR: That completes our presentation.

CHAIRMAN CARR: Any questions?

COMMISSIONER CURTISS: Good briefing.

CHAIRMAN CARR: Well, I want to thank the NRC staff and also their assistants, Ted and C.Y., for this informative briefing. Encourage you to continue your aggressive efforts in identifying these type of emerging technical issues.

It's equally important, however, these issues be resolved in a timely manner and not be allowed to linger unresolved by either NRC or the licensees if we determine the problem is of such sufficient urgency.

I would suggest that in the future if you turn up items like this, personally I'd be interested in hearing about them. I think it's a valuable briefing.

Any additional comments? If not, we stand adjourned.

(Whereupon, at 11:00 a.m., the above-entitled matter was adjourned.)

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This is to certify that the attached events of a meeting of the United States Nuclear Regulatory Commission entitled:

TITLE OF MEETING: BRIEFING ON EMERGING TECHNICAL ISSUES

PLACE OF MEETING: ROCKVILLE, MARYLAND

DATE OF MEETING: OCTOBER 25, 1989

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Carol Lynch

Reporter's name: PETER LYNCH

BRIEFING ON EMERGING TECHNICAL ISSUES
OCTOBER 25, 1989

Thomas E. Murley
James E. Richardson
Frank J. Congel
Frank J. Miraglia
Brian K. Grimes

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STRESS CORROSION OF INCONEL 600 ALLOYS

ISSUE:

- Pure Water Stress Corrosion Cracking

BACKGROUND:

- Residual Stresses from Fabrication
- Pressurizer Penetrations
- Steam Generator Tubes and Plugs

CURRENT AND PLANNED STAFF ACTIONS:

- Calvert Cliffs-2 Pressurizer Repair
- Considering NRC Bulletin Requiring Inspection of Susceptible Components

TEMPORARY NON-CODE
REPAIR OF PIPING

ISSUE:

- Structural Integrity of Piping

BACKGROUND:

- Non-Code Repair to Avoid Plant Shutdown

CURRENT AND PLANNED STAFF ACTIONS:

- Proposed Generic Letter
  - Relief for Class 1&2 Pipe Reviewed on a Case-by-Case Basis
  - Relief Criteria for Class 3 Pipe

INSERVICE TESTING (IST) RULE

ISSUE:

- Inservice Testing Requirements Deficient in Assuring Operability of Pumps & Valves

BACKGROUND:

- Part 50 Requires Testing of Components
- ASME Criteria Used for Testing
- ASME Criteria are Not Sufficient

CURRENT AND PLANNED STAFF ACTIONS:

- Inservice Testing Generic Letter
- Motor Operated Valve Generic Letter
- Rulemaking Effort Being Initiated

CORROSION OF STEEL CONTAINMENT

ISSUE:

- Potential Loss of Containment Integrity

BACKGROUND:

- Corrosion in Several Steel Containments
  - Mark I (Drywell & Torus)
  - Ice Condenser

CURRENT AND PLANNED STAFF ACTIONS:

- Information Notices & Generic Letter Issued
- Proposed Generic Letter for Periodic Inservice Inspection

ELECTRICAL DISTRIBUTION SYSTEM WEAKNESSES

ISSUE:

- Ability of EDS to Perform Safety Functions

BACKGROUND:

- Uncontrolled Load Growth - AC & DC
- Incorrect Setpoints for Protective Relays
- Nonsafety Bus Transfer Failures
- SBO Rule Assumes EDS Works as Designed

ELECTRICAL DISTRIBUTION SYSTEM WEAKNESSES (Cont'd)

CURRENT AND PLANNED STAFF ACTIONS:

- Develop Team Inspection to Assess:
  - Technical Adequacy and Functionality of EDS
  - Configuration Control of EDS
  - Engineering and Technical Support

INTERFACING SYSTEMS LOCA

ISSUE:

- Precursor Experience Indicates ISLOCA Outside Containment May Be More Probable Than Previously Estimated

BACKGROUND

- Current PRAs Predict Low Core Damage Frequency
- Numerous Recent Human Errors Related to Loss of Pressure Isolation

CURRENT AND PLANNED STAFF ACTIONS

- Operational Data Assessment
- Selected Plant Audits to Assess Status
- Balanced Research Program to Evaluate Risk Significance

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Meeting Date: 10/25/89 Open X Closed ______

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