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NUCLEAR REGULATORY COMMISSION

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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

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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?

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1 If not, Mr. Taylor, you can proceed.

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

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

16 I would like to mention to the Commission
17 too, and perhaps this -- and I'll let Doctor Murley
18 and the staff try to respond to your questions -- but
19 these were selected really as issues that are in the
20 process of being understood, developed, reviewed in a
21 number of cases. I think generally, and I'll let Tom
22 and the others address it, are not yet at what I call
23 the stage of resolution. But the staff did want to
24 tell you of these issues because they are important
25 and they are issues that the staff's working on and

1 tend, one way or the other, to bring resolution.
2 Resolution may be not a need for a rule or a need for
3 regulatory action. And then, again, it may result in
4 that. But I'll let the staff pick up on that.

5 Tom? Tom Murley.

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

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

25 As the process of screening those events and

1 following them, we do notice patterns from time to
2 time and we do notice where operating experience tells
3 us that maybe there's a safety issue that we haven't
4 looked at before.

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

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

20 MR. MIRAGLIA: Thank you, Tom.

21 Good morning, Commissioners.

22 As Tom and Jim have said, the operating
23 experience and inspection results are a source of
24 identifying potential generic concerns to the staff.
25 As has been indicated, some of these issues are better

1 understood. We've looked at them longer. Sometimes
2 operating experience and inspection results reveal
3 things. They ask us to go back and relook at things
4 that we had looked at in the past.

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

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

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

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

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

20 Because of our previous experience with
21 Inconel 600 and what we've seen here, we've been
22 working with the CE owner's group to develop whether
23 there's similar pressurizer heater tubes fabricated in
24 a similar manner in other plants. Our current
25 thinking along these lines is as the information

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1 develops, we may need to develop generic communication
2 in the form of a bulletin. We've already issued an
3 information -- a generic communication on an
4 information notice informing the industry -- but a
5 bulletin that might indicate a need for augmented in-
6 service inspection at susceptible locations that have
7 these fabrication histories.

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

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

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

21 MR. MIRAGLIA: Not on the Calvert Cliffs
22 situation. Now, there is foreign experience that
23 indicates that they are also seeing stress corrosion
24 cracking in steam generator tubes. That is
25 circumferential and that's because of how the tubes

1 were fabricated again. It's a rolling kind of
2 fabrication and therefore the picture -- the
3 fabrication technique coupled with the pure water sets
4 the environment that you get the corrosion after the
5 fact. In that case it results in circumferential
6 cracking. In the cases that we've seen here at
7 Calvert Cliffs, it's axial cracking and that's why
8 it's of a lesser concern.

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

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

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

23 MR. MIRAGLIA: I could let me staff answer
24 that one. I think you need several environments. You
25 need the pure water and the stress. I think if you

1 reduce the stress, that would take care of a
2 significant contributor.

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

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

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

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

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

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

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

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

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

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

22 MR. MIRAGLIA: In the case of the Calvert
23 Cliffs situation, these tubes needed to be reamed out
24 so they can accommodate the pressurizer heaters. So
25 there's actually cold working of a short end to ream

1 that tube out to have the sufficient diameter to
2 accept the heat. So, each unique application perhaps
3 would add the ingredient of stress. As C.Y. has
4 indicated, you need three ingredients.

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

7 COMMISSIONER ROBERTS: All right.

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

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

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

24 MR. MIRAGLIA: Yes, I would say yes.

25 COMMISSIONER CURTISS: Okay.

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

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

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

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

18 CHAIRMAN CARR: Okay. Let's proceed.

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

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

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

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

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

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

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

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

1 50.59 process.

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

4 MR. MIRAGLIA: Yes.

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

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

13 CHAIRMAN CARR: That's pre-repair?

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

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

20 MR. MIRAGLIA: That's correct.

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

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

25 CHAIRMAN CARR: And would we not require any

1 increased inspection of that repaired area between
2 those times?

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

6 No further questions?

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

20 The staff has a long-term effort underway.
21 We have issued a number of generic letters. We have
22 issued an in-service testing and generic letter where
23 we've clarified what our views and positions are with
24 respect to reliefs to in-service testing. That
25 generic letter was issued, I believe, late summer or

1 early fall, maybe it was even earlier.

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

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

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

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

22 We would clearly want the new rule to
23 indicate the scope of an IST program. As currently
24 interpreted and defined, it clearly gets and captures
25 ASME code class components. However, there are pumps

1 and valves out there that may not be of code class
2 that are important to safety and perform safety-
3 related functions that require in-service testing, so
4 we want to make sure the scope of the rule is broad
5 enough.

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

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

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

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

23 This summer we had a symposium in downtown
24 Washington where we discussed a number of IST-related
25 issues, pumps and valve testing standards. We had a

1 good feedback from that meeting. There was an
2 excellent exchange of information. The industry is
3 generally very receptive to occasions where you
4 exchange information of this sort and it hasn't
5 happened before in the IST area. So, it was very well
6 received. We've gotten a number of issues we think
7 need to be worked on, we've taken them to the code and
8 they have progressed. So, they work and we work on
9 those issues.

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

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

21 CHAIRMAN CARR: Thank you. Commendable.

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

25 MR. MIRAGLIA: I think that the question as

1 constructed is difficult to answer. We have modified
2 the MOV letter to indicate valves that would be in the
3 secondary system, yes.

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

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

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

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

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

22 COMMISSIONER CURTISS: Okay.

23 MR. MIRAGLIA: In addition, since the rule
24 change is a longer term project and it's really in the
25 development stage, we've also felt that we need to

1 work with AEOD and Research to say what's coming out
2 of the research programs and the study of the trends
3 in operational data to say, what are the material
4 pumps and valves that ought to be covered in this kind
5 of rulemaking?

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

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

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

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

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

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

25 COMMISSIONER CURTISS: In a case like Nine

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

7 MR. MIRAGLIA: Yes.

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

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

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

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

18 COMMISSIONER CURTISS: Okay.

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

22 COMMISSIONER CURTISS: Right.

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

25 DOCTOR MURLEY: I think it's important to

1 keep this in the safety perspective that as long as it
2 meets code, it still has margin of two to three times
3 above design basis. What we're talking about is
4 margin above the code even.

5 COMMISSIONER CURTISS: Right.

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

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

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

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

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

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

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

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

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

25 Another item of experience is incorrect set

1 points for protective relays that could affect the
2 availability of both safety trains in some
3 circumstances. If you reached another voltage or some
4 other condition that tripped off both safety trains,
5 you would lose for at least some period of time the
6 ability to run key safety equipment.

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

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

1 conduct.

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

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

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

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

1 year period.

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

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

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

23 DOCTOR MURLEY: Let me add a point to what
24 Brian just said, just to recap. You know, our
25 inspection program consists roughly of one-third of a

1 core inspection program that all plants get, emergency
2 preparedness, health physics, and that sort of thing.

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

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

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

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

23 CHAIRMAN CARR: Doesn't this problem really
24 lend itself to testing? Can't you just go out and do
25 a selective trip test? Tell them, "Okay, drop it and

1 see what picks up and what don't. See if you can
2 carry it."

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

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

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

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

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

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

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

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

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

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

19 MR. MIRAGLIA: -- and that's how we found
20 some of these ground breaker coordination problem and
21 the like that Brian has described. What we've done
22 also in setting up this inspection module is to go
23 back and look a precursor events and electrical events
24 to say which ones were significant precursors to more
25 serious kinds of -- what systems should we concentrate

1 on? I think we have that as input to developing this
2 thing.

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

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

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

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

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

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

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

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

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

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

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

25 MR. GRIMES: I would say that wouldn't give

1 us the level of confidence we're looking for. I think
2 what we'll find by sampling is some plants we won't
3 find many problems and we'll get some added degree of
4 confidence. If we do find some significant problems,
5 then it's going to be up to the utility then to pursue
6 with substantial additional resources some really in-
7 depth --

8 MR. TAYLOR: Review and testing.

9 MR. GRIMES: -- reviewing and testing.

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

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

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

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

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

25 DOCTOR MURLEY: But there may be some

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

8 CHAIRMAN CARR: I don't either.

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

13 CHAIRMAN CARR: I am well aware of that.

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

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

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

25 COMMISSIONER CURTISS: I guess one of the

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

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

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

19 MR. MIRAGLIA: What our current thinking
20 would be is to handle it similarly to what we've done
21 in the maintenance team inspection. They wouldn't
22 start until the maintenance team inspections are
23 completed, and those are scheduled to go a little
24 beyond the start of fiscal '91. Our initial plan
25 would be to do all the plants, but I think what we've

1 done, as we've done in the maintenance team
2 inspections, after we've done some should we change
3 the inspection technique, the scope or the depth?
4 We'd have to assess that and that would be an ongoing
5 activity.

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

8 MR. MIRAGLIA: We're looking at the start of
9 FY '91 going through '93, potentially into early '94.

10 COMMISSIONER CURTISS: Okay.

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

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

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

18 CHAIRMAN CARR: And maintenance.

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

25 We've had numbers of cases where this has

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

10 CHAIRMAN CARR: Okay. Let's proceed.

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

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

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

24 An interfacing system LOCA can occur when
25 the barrier that separates out the operating system at

1 power from the subsystems that are designed to operate
2 at lower pressures is breached. The special problem
3 with this kind of a LOCA is that if it occurs, it
4 generally introduces primary coolant outside of the
5 containment so that you actually have breaching of two
6 barriers essentially at the same time.

7 The problem itself is not new. It was
8 studied extensively by the Reactor Safety Study WASH
9 1400 and placed in the perspective with other loss of
10 coolant accidents. And in fact had not attracted much
11 attention since then because based on probabilistic
12 risk assessment the issue did not show up very high
13 numerically. To put it in perspective, it is in the
14 order of 10^{-6} type of event.

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

25 I'd like to emphasize here and I will later

1 on in my discussion that we have not concluded at this
2 point that it is significant. We are looking into the
3 event to determine if it is.

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

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

1 recognized.

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

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

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

25 As I mentioned earlier, the technical

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

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

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

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

13 MR. CONGEL: Yes.

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

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

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

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

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

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

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

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

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

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

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

1 we?

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

4 MR. TAYLOR: That completes our
5 presentation.

6 CHAIRMAN CARR: Any questions?

7 COMMISSIONER CURTISS: Good briefing.

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

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

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

22 Any additional comments? If not, we stand
23 adjourned.

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

CERTIFICATE OF TRANSCRIBER

This is to certify that the attached events of a meeting
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TITLE OF MEETING: BRIEFING ON EMERGING TECHNICAL ISSUES

PLACE OF MEETING: ROCKVILLE, MARYLAND

DATE OF MEETING: OCTOBER 25, 1989

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**BRIEFING ON EMERGING TECHNICAL ISSUES
OCTOBER 25, 1989**

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

Contact: Charles E. Rossi
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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