

NUCLEAR REGULATORY COMMISSION

Title: Advisory Committee on Reactor Safeguards
507th Meeting

PROCESS USING ADAMS
TEMPLATE: ACRS/ACNW-005

Docket Number: (not applicable)

Location: Rockville, Maryland

Date: Wednesday, November 5, 2003

Work Order No.: NRC-1154

Pages 1-28

NEAL R. GROSS AND CO., INC.
Court Reporters and Transcribers
1323 Rhode Island Avenue, N.W.
Washington, D.C. 20005
(202) 234-4433

TROY

**ACRS OFFICE COPY
RETAIN FOR THE LIFE OF THE COMMITTEE**

1 UNITED STATES OF AMERICA
2 NUCLEAR REGULATORY COMMISSION

3 + + + + +

4 507TH MEETING

5 ADVISORY COMMITTEE ON REACTOR SAFEGUARDS (ACRS)

6 + + + + +

7 WEDNESDAY, NOVEMBER 5, 2003

8 + + + + +

9 ROCKVILLE, MARYLAND

10 + + + + +

11 The Advisory Committee met at 10:30 a.m.
12 at the Nuclear Regulatory Commission, Two White Flint
13 North, Room T2B3, 11545 Rockville Pike, Dr. Mario V.
14 Bonaca, Chairman, presiding.

15 COMMITTEE MEMBERS:

16	MARIO V. BONACA	Chairman
17	GRAHAM B. WALLIS	Vice-Chairman
18	STEPHEN L. ROSEN	Member-at-Large
19	F. PETER FORD	Member
20	GEORGE E. APOSTOLAKIS	Member
21	THOMAS S. KRESS	Member
22	GRAHAM M. LEITCH	Member
23	VICTOR H. RANSOM	Member
24	WILLIAM J. SHACK	Member
25	JOHN D. SIEBER	Member

NEAL R. GROSS
COURT REPORTERS AND TRANSCRIBERS
1323 RHODE ISLAND AVE., N.W.
WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 ACRS STAFF PRESENT:

2 MARVIN D. SYKES

3 JOHN T. LARKINS Executive Director-ACRS/ACNW

4 SHER BAHADUR Associate Director-ACRS/ACNW

5 HOWARD J. LARSON Special Assistant-ACRS/ACNW

6 SAM DURAISWAMY Technical Assistant-ACRS/ACNW

7

8 PRESENTERS:

9 SATISH AGGARWAL NRR

10 AMRITPAL GILL

11

12 NRC STAFF PRESENT:

13 SHERRY A. MEADOR

14 SAMUEL HERNANDEZ

15 NILESH C. CHOKSHI

16 JIENDRA VORA

17 ALLEN HISER

18

19

20

21

22

23

24

25

NEAL R. GROSS
COURT REPORTERS AND TRANSCRIBERS
1323 RHODE ISLAND AVE., N.W.
WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

I-N-D-E-X

<u>Agenda Item</u>	<u>Page</u>
1) Opening Remarks by the ACRS Chairman	4
1.1) Opening Statement	4
1.2) Items of current interest	5
2) Draft Final Regulatory Guide 1.32, Revision 3, "Criteria for Power Systems for Nuclear Plants"	6
2.1) Remarks by the Subcommittee Chairman	6
2.2) Briefing by and discussions with representatives of the NRC staff regarding the draft final Revision 3 to Regulatory Guide 1.32 which endorses IEEE Standard 308-2001, "Criteria for Class 1E Power Systems for Nuclear Generating Systems"	7

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS
1323 RHODE ISLAND AVE., N.W.
WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

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

(10:27 a.m.)

1) OPENING REMARKS BY THE ACRS CHAIRMAN

1.1) OPENING STATEMENT

CHAIRMAN BONACA: Good morning. The meeting will now come to order. This is the first day of the 507th meeting of the Advisory Committee on Reactor Safeguards.

During today's meeting, the committee will consider the following: draft final Regulatory Guide 1.32, Revision 3, "Criteria for Power Systems for Nuclear Plants"; safeguards and security matters. This meeting will be closed between 1:30 and 7:00 p.m. to discuss safeguards and security matters.

This meeting is being conducted in accordance with the provisions of the Federal Advisory Committee Act. Dr. John Larkins is the designated federal official for the initial portion of the meeting.

We have received no written comments or requests for time to make oral statements from members of the public regarding today's sessions. A transcript of portions of the meeting is being kept. It is requested that the speakers use one of the microphones, identify themselves, and speak with

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS
1323 RHODE ISLAND AVE., N.W.
WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 sufficient clarity and volume so that they can be
2 readily heard.

3 1.2) ITEMS OF CURRENT INTEREST

4 CHAIRMAN BONACA: Before we move on to the
5 first item on our agenda, I would like to point out
6 that between 11:30, when this meeting is supposed to
7 recess, and 1:30, you are not going to have a long
8 lunch. What is going to happen is that I would like
9 you to get some lunch with you, come back here at
10 12:15, if you could, and help me discuss the issue of
11 stabilizing the PRA quality expectations and
12 requirements. Then at 12:45, we are having Gary
13 Hollahan come in and share some of the thoughts and
14 give him some of the views of the committee on that
15 issue that you know of. I sent out a request about 10
16 days ago for discussion and review.

17 The pressure for this timing is already
18 coming from the means of the commission. So I would
19 like to ask you to be patient with that and come back
20 here at 12:15 and be ready to discuss that issue.

21 So with that, let's move on to the first
22 item on the agenda, which is the final draft final
23 Regulatory Guide 1.32. John Sieber is going to take
24 us through that presentation.

25 MEMBER SIEBER: Thank you, Mr. Chairman.

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS
1323 RHODE ISLAND AVE., N.W.
WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 2) DRAFT FINAL REGULATORY GUIDE 1.32, REVISION 3,

2 "CRITERIA FOR POWER SYSTEMS FOR NUCLEAR PLANTS"

3 2.1) REMARKS BY THE SUBCOMMITTEE CHAIRMAN

4 MEMBER SIEBER: Reg Guide 1.32 relates to
5 power systems and endorses IEEE standard 308. If you
6 research standard 308, the original version was
7 published in 1970. And there have been six revisions
8 to it, last of which was published in 2001 and was
9 basically an update and brought in things like
10 verification and validation, which we discussed at our
11 last meeting.

12 Standard 308-2001 specifically
13 incorporates five other IEEE standards. And these are
14 incorporated in the body of the text of the standard.
15 It also references 11 additional IEEE standards. Now,
16 the ones that are referenced are not required under
17 the reg guide if they're referenced in the back, but
18 if they're referenced in the text of the standard,
19 they are.

20 So, with that little bit of introduction,
21 I have gone through all of these standards and the reg
22 guide and the comments. And so I think that we are
23 now prepared for the staff's presentation. So, with
24 that, Satish Aggarwal, you can begin your
25 presentation.

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS
1323 RHODE ISLAND AVE., N.W.
WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 MR. AGGARWAL: Thank you, John.

2 2.2) BRIEFING BY AND DISCUSSIONS WITH
3 REPRESENTATIVES OF THE NRC STAFF

4 MR. AGGARWAL: Mr. Chairman, this is
5 revision 3 to regulatory guide 1.32, vital criteria
6 for power systems for nuclear power plants. The
7 purpose of this meeting is to seek your concurrence of
8 the staff position. And we will be looking forward to
9 receiving a letter accordingly.

10 As I pointed out in my last appearance
11 here, there are many, many reg guides in the
12 electrical area which are outdated because they
13 endorse the standards that date somewhere between 1970
14 and onward. The staff is making a sincere attempt to
15 update these reg guides as fast as possible.

16 Before today, before you, this is a
17 standard 308 with the original reg guide that was
18 issued in 1977. Revision 2 of the reg guide endorses
19 the IEEE standard 308-1974, which is, of course,
20 outdated.

21 The staff issued a draft Regulatory Guide
22 DZ1-079 in May 2003 for public comment. This draft
23 guide endorses the IEEE standard 308-2001, as John
24 pointed out earlier.

25 The comment period expired on July 31st,

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS
1323 RHODE ISLAND AVE., N.W.
WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 2003. And we received only one comment letter. That
2 comment letter was attached. The memo, which was sent
3 to John Larkins, you have a copy of it.

4 As you will notice, the comment letter,
5 the comments were editorial, they were minor, and they
6 were incorporated. So as far as the public is
7 concerned, there are no comments, period.

8 Let me just take you and run by you, what
9 are we talking about today and what is the purpose of
10 power systems. As the title tells you, the major role
11 is simply to provide electric power to the reactor
12 trip system, engineering safety features, and
13 auxiliary supporting features.

14 This is a very unique safety system that
15 extends towards the plant and also the supporting
16 system. And I will briefly take a few minutes to talk
17 to you about the scope and tell you what really does
18 it cover.

19 This guide applies to AC power systems, DC
20 power systems, and instrumentation and control power
21 systems. Let me take, as I said earlier, a few
22 minutes to walk through and let you understand what
23 does it really cover.

24 If you are talking about equipment, we
25 will cover switch gear, table. That's a charger.

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS
1323 RHODE ISLAND AVE., N.W.
WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 These are simply examples I just want to give to you.

2 If you are looking at components, we are
3 looking at transformers, the level for 41-60 level, as
4 the case may be, when we talk about sources, we will
5 be looking for standby generators. All are part of
6 the power system.

7 Well, let's talk about actuation devices.
8 And if we are talking about actuation devices, we will
9 be looking at cycle breakers, controllers, control
10 relays, and switching. And if we look at the
11 actuation equipment, we will be looking at motors,
12 heaters.

13 And now if we looked at the
14 instrumentation control and electrical protection, of
15 course, we will be looking for current transformers,
16 voltage transformers, microprocessors, protective
17 relays. They are all part of the power systems.

18 MEMBER LEITCH: So in the case of the
19 diesels, this standard would include the diesel
20 generator but not the engine?

21 MR. AGGARWAL: That's right.

22 MEMBER LEITCH: What about the main unit
23 generators? Are they covered by this?

24 MR. AGGARWAL: No sir.

25 MEMBER LEITCH: Okay. Thank you.

1 MR. AGGARWAL: So essentially now comes
2 what is the principal designed criteria. Well, as
3 usual, under a DBE, the former will not happen. You
4 cannot lose electric power to a number of engineering
5 safety features, surveillance devices, or protection
6 system devices. So that required safety functions
7 cannot be performed, as simple as that.

8 Then you will flip a switch. You expect
9 the light to be there. Similarly, all electric power
10 systems are required to ensure that the power is
11 always available. And you ought to know a loss of
12 electric power to any equipment will result in a
13 reactor transient. That is capable of causing
14 significant damage to the reactor coolant pressure
15 boundary or to fuel flooding.

16 MEMBER LEITCH: So if that were a
17 transient there, it is more severe than might be
18 normally understood? For example, I might think of a
19 reactor scram as a reactor transient, but it's not
20 included in that definition?

21 MR. AGGARWAL: Well, the definition is not
22 there. All it is saying is that, hey, you do not want
23 to see a loss of power to any given system under a
24 design basis even. One redundant train or the
25 division must always be available to perform a safety

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 function. So this is all we are saying. And that is
2 an event in the basic design.

3 If you have a coal spray pump, for
4 example, in a nuclear power plant, and two of them are
5 and one of them is assigned to express, we are saying,
6 hey, one will always be available. So that is a
7 principal design criteria. This is what we want to
8 ensure.

9 MEMBER LEITCH: My only question is the
10 word "transient." What you really mean there is it is
11 a damaging event, right?

12 MR. AGGARWAL: That is right. All we are
13 saying, if you have loss of power for both buses, you
14 have a problem. It could be a reactor scram. It
15 could be a transient. And it could be give you safety
16 function. It's as simple as that.

17 Paul Gill is here from NRR. He was a
18 member of the working group who wrote the standard.

19 Let us walk through what the IEEE for 2001
20 provides. It provides a principal design criteria,
21 which I outline. It provides requirement for the test
22 and surveillance.

23 What really the standard is telling is
24 what kind of a pre-op original equipment test and
25 inspection you will be performing, the standard for

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS
1323 RHODE ISLAND AVE., N.W.
WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 our guidance for pre-operational system test, which
2 must also be performed.

3 And with regard to the surveillance, the
4 operational status information must be provided for
5 the power system inside the control room or outside at
6 all times. This can be done by continuously
7 monitoring or by PRA test, either option. The bottom
8 line is the CRO should be aware what is happening at
9 any time to an E-1 system.

10 Does this standard also provide guidance
11 for sharing safety-related power systems in multi-unit
12 stations? Let me pause here for a moment and bring to
13 your attention that this reg guide as presented to you
14 endorses 308-2001 with a minor exception. And that
15 exception is where you have a regulatory guide 1.81 on
16 sharing shutdown in electric system from multi-unit
17 nuclear power plants.

18 What this guide states is that you shall
19 not share DC systems. Now, as you know, this is a
20 very old guide. In those days, you used to use the
21 word "share," which, as you know, we don't use that
22 any more in reg guides. But this is the way it is.

23 The standard is saying that you can share
24 systems as long as you can technically justify it.
25 The staff position is to maintain the old position,

1 namely you shall not share DC systems in a multi-unit
2 station. I just want to bring it to your attention so
3 you know.

4 Now, the standards also provide the
5 requirement for documentation, verification, and
6 validation. We did talk about this in earlier
7 meetings.

8 MEMBER SIEBER: In this event, V&V only
9 applies to digital systems. For example, there --

10 MR. AGGARWAL: Essentially.

11 MEMBER SIEBER: There are a lot of digital
12 devices that are now used as protection devices,
13 timing relays, and so forth, which have a program.
14 And V&V would be applied to that.

15 MR. AGGARWAL: That is correct. At the
16 point of information to the committee, the staff will
17 be coming soon, hopefully early next year, a standard
18 which is on computer, use of computer and safety
19 systems. We are trying to deal with ahead of IEEE
20 2003. It is still under print.

21 And the staff has already prepared a reg
22 guide endorsing that. And the goal is that the moment
23 the standards are available, they are here. And that
24 will again cover V&V, specifically the digital
25 equipment.

1 I would also like to bring to your
2 attention now what are the significant changes in
3 1974. Some of them which you, John, highlighted, but
4 let me very briefly walk through. You see, when we
5 were writing the standard in the 1974, our experience
6 was very limited in nuclear power plants.

7 We really didn't know what we were really
8 doing. And the information was sketchy but was still
9 defendable. Over 30 years, we have learned that. And
10 we are trying to provide an up-to-date status on the
11 state-of-the-art of the technology.

12 So we have clearly now defined what is our
13 design basis for safety-related power systems are. In
14 my last meeting with you, I talked to you about
15 single-failure criteria quite at length, the
16 application.

17 And, again, the same criteria applies to
18 the power systems. Then the basic issue some of you
19 may be aware of is that in this state, there are
20 concerns that the utility put a lot of
21 non-safety-related load on safety-related buses. It
22 is a normal practice. And economics drives that kind
23 of a practice.

24 So it was imperative that a standard come
25 out and tell, "Hey, when you do so, what we would like

1 you, when you would like the load to be disconnected."

2 And that guidance is included in 2001.

3 Independent of the safety-related power
4 system, this is another issue where, again, at the
5 point of information to the committee, the staff will
6 be coming soon. As a matter of fact, you already have
7 seen the draft guide, Reg Guide 1.75, on independence
8 criteria. We know the status is trying to be more
9 realistic in terms of those distances. So this
10 standard provides that guidance also.

11 One of the other things we did was provide
12 some guidance for the circuits that penetrate
13 containment. Let me briefly explain to you what I
14 meant by that, the idea being that the failure of any
15 circuit, whether AC/DC, doesn't matter, any circuit,
16 shall not result in exceeding the current versus
17 capability of penetration for concentration for that
18 circuit, essentially saying that, hey, don't lose it
19 under any circumstances.

20 I briefly touched earlier when I talked
21 about pre-op testing of safety-related systems. Does
22 the standard provide guidance? I also talked about a
23 total of other items, namely the multi-unit
24 consideration, and the surveillance requirements for
25 safety systems.

1 MEMBER LEITCH: As far as future reactors
2 go, might it be more clear to indicate whether you are
3 speaking about multi generators or multi reactors when
4 you say "multi-unit"? I'm not sure what you mean.

5 I could envision a time when there might
6 be two reactors, for example, in a modular situation,
7 two reactors driving one turbine. Is that one unit or
8 two?

9 MR. AGGARWAL: This IEEE standard is still
10 based on a current design.

11 MEMBER LEITCH: It's based on?

12 MR. AGGARWAL: Current design.

13 MEMBER LEITCH: Current design. And when
14 we talked about multi-unit, we simply meant more than
15 one BWR at one plant or more than one PWR.

16 MR. AGGARWAL: So it assumes that there is
17 one reactor driving one generator.

18 MEMBER LEITCH: That could be. That could
19 be. But I may also point out as a point of
20 information, I am now going to change my hat to IEEE.
21 We in IEEE are looking ten to 15 years ahead. We are
22 looking at different designs, possible designs, which
23 may be used anywhere in the world.

24 What is behind it is that even though the
25 United States is not having a license in new plants,

1 many other countries are. And these standards are
2 used worldwide.

3 Besides, ten years from now, we will come
4 with a newer advanced reactor. Then the standards
5 should be up to date. So we are looking in the design
6 basis events on those designs and how and why and what
7 area we should revise this standard. That has already
8 taken place and will continue.

9 MEMBER SIEBER: It seems to me that the
10 mid-term reactors or transitional reactors like
11 AP1000, AP600, ESBWR, the concepts involved there were
12 considered by the staff in the development of this
13 standard.

14 MR. AGGARWAL: That's right.

15 MEMBER SIEBER: So, really, what you are
16 talking about for a new standard or another revised
17 standard goes beyond those intermediate concepts.

18 MR. AGGARWAL: We will create probably
19 more --

20 MEMBER LEITCH: There was a plant on the
21 drawing boards. It was never built. It had, I think
22 it was, two reactors driving one turbine or maybe it
23 was the other way around. I forget which.

24 MR. AGGARWAL: Yes. Probably --

25 MEMBER LEITCH: It was never built, but it

1 had a construction permit, I think.

2 MR. AGGARWAL: Well, the focus in this
3 standard is not how to define multi-unit stations.
4 Focus is very simple in this standard. They are
5 talking about whether you share systems. I give you,
6 for example, some of you again may be familiar with
7 Hatch nuclear power plant at three diesel generators.
8 Okay? One is assigned to each unit.

9 MEMBER SIEBER: Right.

10 MR. AGGARWAL: And it can be shared by the
11 unit. So you need some kind of a requirement when
12 there is sharing involved. It's a simple example.
13 Does this standard provide that kind of criteria?
14 What do you do?

15 MEMBER SIEBER: Actually, the standard
16 focuses on the protection of a single reactor.

17 MR. AGGARWAL: Basically.

18 MEMBER SIEBER: And so the extent to which
19 all of the protection systems and electric power
20 systems apply to a single reactor, then if there is a
21 multi-unit site in the sharing restrictions, which
22 aren't allowed for DC under reg guide 1.81, I think,
23 and to a limited extent for AC. So I think you could
24 fit it into a multi-reactor, multi-unit plant.

25 MR. AGGARWAL: That's right, John.

1 VICE-CHAIRMAN WALLIS: When you say "we"
2 all the time, you are talking about IEEE?

3 MR. AGGARWAL: I highlighted when I say I
4 am changing my hat.

5 VICE-CHAIRMAN WALLIS: Yes, but most of
6 the time you are talking about IEEE, and you still say
7 "we." Is that because the NRC has a significant
8 representation on the IEEE committee or something?

9 MR. AGGARWAL: That is correct.

10 VICE-CHAIRMAN WALLIS: All right.

11 MR. AGGARWAL: Just to clarify, our staff
12 is participating in the development of all nuclear
13 standards. In 1990, we did publish all the nuclear
14 standards applied to nuclear power plants. But, as
15 you know, we are no longer in the paper world. They
16 are electronic. So we are not going to publish any
17 more of this kind of compilation. The standards are
18 available electronically.

19 Yes, the staff participates at the nuclear
20 power engineering committee. We participate at
21 different subcommittee levels. And the staff heavily
22 participates in working group actually writing the
23 standards.

24 As an example, I pointed out Paul Gill is
25 from NRR, from the Electrical Branch. He was the

1 member of the working group who developed the
2 standards. And he is still there.

3 VICE-CHAIRMAN WALLIS: Is this the
4 shortest reg guide ever written?

5 MR. AGGARWAL: Yes, sir, because it's very
6 simple. You see, let me again point out one thing.
7 It may not appear to many people at the front side.
8 In all the reg guides if you go back, we take many,
9 many exceptions.

10 What the staff is doing is working hard
11 with the industry and let them understand where he is
12 coming from and see if we can sell our point of view.
13 Thereby, we do not take exceptions because those
14 requirements meet the regulations. And the added
15 advantage is that I don't have to come here and defend
16 the exceptions. So the staff addressed let's do it at
17 the IEEE level.

18 Now, 603 IEEE, this was a major part in
19 this standard that it should be consistent. I might
20 also point out that 603 is incorporated by reference
21 in our regulations.

22 John pointed out earlier that many of
23 these standards, the criteria was provided for
24 interfacing with IEEE standards, which are cited here.
25 And, finally, I would like to point out two more

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS
1323 RHODE ISLAND AVE., N.W.
WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 things, that the criteria for power quality, to
2 include potentially fact of harmonic distortion and
3 degraded grid conditions, were included.

4 Now let me talk to you about what harmonic
5 distortion really means. The variation of voltage,
6 frequency, and form, including the fact of harmonic
7 distortion, in any mode we have provided the guidance
8 in this standard.

9 What we are really saying, in nuclear
10 plants, power plant operation shall no degrade the
11 performance of any safety systems or load at any given
12 time. And this is essentially the criteria given
13 here.

14 We also provided how do you deal with
15 degraded grid conditions. And this takes you to
16 another IEEE standard, 741. Hopefully we get some
17 time available. We will also try to endorse that.

18 So essentially, Mr. Chairman, as pointed
19 out, the very simplistic or direct guide endorsing the
20 consensus standards, this will conclude my
21 presentation with the request that the staff is
22 looking forward to receiving a letter of endorsement
23 from the ACRS. And I will be happy to answer any
24 other questions you might have or any other member
25 might have.

1 MEMBER SIEBER: I have --

2 MR. AGGARWAL: Yes, sir?

3 MEMBER SIEBER: -- an issue you may want
4 to think about. And it has to do with DC power
5 systems when they are used to power
6 microprocessor-based controls or protection devices.

7 The fact that a DC power system is sitting
8 on a battery with some capacity but as relays open and
9 close, you get lots of harmonic distortions, that's a
10 reflection on the bus itself, which has a tendency and
11 can trip microprocessor devices. I've seen a number
12 of examples.

13 Unfortunately, if you have the same
14 devices on every bus, all the buses fail to operate
15 properly.

16 MR. AGGARWAL: Sure.

17 MEMBER SIEBER: It changes through the
18 lifetime as relay contacts get dirty and reluctance
19 changes and so forth. So to me that is sort of a
20 serious problem which says you almost ought to be
21 looking at DC buses for harmonic distortion on a
22 periodic basis because it changes through the life of
23 the plant.

24 I don't see that specifically in here, but
25 I think one could interpret that that is an issue.

1 And if you use the surge protection regulations or
2 standards, you can probably construe those to avoid
3 this situation. But it has occurred in plants. So I
4 would just mention that to me, it is an issue.

5 MR. AGGARWAL: Yes. John, you are right.
6 It is a concern. Particularly more and more
7 microprocessors --

8 MEMBER SIEBER: That's right.

9 MR. AGGARWAL: -- and these documents are
10 used in nuclear power plants. To me, that is implicit
11 in this standard but is not explicit.

12 MEMBER SIEBER: That's right.

13 MR. AGGARWAL: I totally agree with you.
14 And Paul will take this to the committee at the next
15 significant time.

16 MR. GILL: As a matter of fact, we have
17 talked about the impact of harmonics --

18 MEMBER SIEBER: Right.

19 MR. GILL: -- on DC and AC systems.

20 MEMBER SIEBER: Yes. I think that the
21 committee should know I know a couple of people on it.
22 And I know that they know what I know.

23 MR. AGGARWAL: Yes. This is serious. I
24 mean, you talk about inter-power plant. I'm even
25 concerned at my home. I mean, I am not concerned with

1 the distortion there because there is no DC power.

2 MEMBER SIEBER: Right.

3 MR. AGGARWAL: But, hey, any kind of
4 distortion can knock out my motherboard on my
5 computer. So, you know, it is a fear. And when you
6 talk about nuclear power plants, DC systems, they can
7 bring havoc if they fail to perform.

8 CHAIRMAN BONACA: We had a question up
9 here from Steve.

10 MEMBER ROSEN: One question about your
11 expectations for this standard being adopted as an
12 ANSI standard.

13 MR. AGGARWAL: As a matter of policy, all
14 of the standards which are IEEE standards become ANSI
15 standards. And we work under that guidance.

16 I might also extend your question a little
17 further. IEEE is now looking on a broader view. And
18 we are looking as a whole. And we want to work
19 together with IEC to ensure that some of our
20 standards, either they're published with a logo or we
21 at least move in that direction.

22 And that is staff because today if you
23 built a reactor in a foreign country, they keep asking
24 you, "Did you read ISO 9000?" and people in the U.S.
25 say, "What?" So we want to look into how we have a

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS
1323 RHODE ISLAND AVE., N.W.
WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 happy marriage.

2 ANSI standard is a no, never mind
3 situation. All of the standards become ANSI
4 standards. But how will we get them adopted
5 throughout the world in conjunction with IEC? It's a
6 goal.

7 And, again, I'm speaking for IEEE and not
8 for the NRC staff.

9 MEMBER ROSEN: Okay.

10 MR. AGGARWAL: Thank you.

11 Any other questions?

12 MEMBER LEITCH: It's interesting to me
13 that over the past few days and I guess predicted for
14 the next couple of weeks, there is a discussion about
15 solar flares. Was there any consideration of that in
16 this standard? I know those activities --

17 MR. AGGARWAL: Not in this standard, but
18 this is one of the technical issues you know, evolving
19 issues, which you may want to look into. Remember a
20 few years ago they talked magnetic disturbances
21 developing from some? This is again something very
22 new.

23 And as we progress in developing the
24 standards, we will give due consideration. And,
25 again, the workgroup is going to look into it.

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS
1323 RHODE ISLAND AVE., N.W.
WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 MR. GILL: Well, in part, the standard
2 covers the safety systems. And they are in the
3 building.

4 MEMBER SIEBER: That's right.

5 MR. GILL: So they're not impacted as the
6 systems that are outside the building. So solar --

7 MEMBER LEITCH: I guess it's mainly been
8 a problem with high-voltage transmission systems.

9 MR. GILL: And transformers and equipment
10 and so on. So by the time that energy travels inside
11 the building, it's attenuated to the point that it's
12 not something that the working group is aware of.

13 So should we find any operating
14 experience, we will then duly take to consider that or
15 include it in the next revision. So every five years
16 as an IEEE body, we are going to revise 308.

17 MEMBER LEITCH: It seems to me there was
18 one plant that I guess felt were particularly
19 susceptible from a grid stability situation if they
20 lost certain transmission lines and they reduced power
21 or maybe -- I don't think they took a unit off, but I
22 think they reduced power. As I recall, it was Salem
23 and Hope Creek in that complex there during a period
24 of solar flare activity they reduced power.

25 They have not done that this time to the

1 best of my knowledge. But I think one of the units is
2 off for refueling anyway. So it's an interesting
3 thing.

4 MR. AGGARWAL: Paul mentioned five and ten
5 years. That comes out of the ANSI. ANSI has told us
6 that they will not tolerate any standard 30 years old
7 or 25 years on the books. They're asking now that ten
8 years is a life standard and that during that time you
9 can revise earlier, but you must revise.

10 MEMBER LEITCH: Or reaffirm.

11 MR. AGGARWAL: Or reaffirm or do something
12 about it. Okay?

13 MEMBER LEITCH: Yes.

14 MR. AGGARWAL: Failing such a decision by
15 IEEE will no longer be an ANSI standard.

16 MEMBER SIEBER: Well, does anybody else
17 have any questions?

18 (No response.)

19 MEMBER SIEBER: If not, I would like to
20 thank the staff very much for their work and their
21 presentation. And, Mr. Chairman, that's it.

22 CHAIRMAN BONACA: Thank you.

23 MR. AGGARWAL: Thank you very much.

24 CHAIRMAN BONACA: A good presentation.

25 MR. AGGARWAL: I think you will have a

1 little longer lunchtime now.

2 CHAIRMAN BONACA: Well, it will put us
3 back on our schedule. That's great. Thank you for
4 that. I think we will take a recess for lunch now.
5 And I think we will go off the record for the day. We
6 will start again tomorrow morning. And we meet again
7 here at 12:15 to exchange views on this document that
8 you have all received before Gary comes at 12:45.

9 (Whereupon, at 11:04 a.m., the foregoing
10 matter was recessed for lunch, to
11 reconvene at 12:15 p.m. the same day in
12 closed session.)

13

14

15

16

17

18

19

20

21

22

23

24

25

CERTIFICATE


This is to certify that the attached proceedings
before the United States Nuclear Regulatory Commission
in the matter of:

Name of Proceeding: Advisory Committee on
Reactor Safeguards
507th Meeting

Docket Number: n/a

Location: Rockville, MD

were held as herein appears, and that this is the
original transcript thereof for the file of the United
States Nuclear Regulatory Commission taken by me and,
thereafter reduced to typewriting by me or under the
direction of the court reporting company, and that the
transcript is a true and accurate record of the
foregoing proceedings.


Pippy Kravchonok
Official Reporter
Neal R. Gross & Co., Inc.

NEAL R. GROSS
COURT REPORTERS AND TRANSCRIBERS
1323 RHODE ISLAND AVE., N.W.
WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

Regulatory Guide 1.32 Rev 3
Criteria for Power Systems
Presentation to
Advisory Committee on Reactor
Safeguards
November 05, 2003



Satish Aggarwal
Office of Nuclear Regulatory Research
301-415-6005

Criteria for Power Systems

- Original Guidance issued in Feb 1977 (Regulatory Guide 1.32, Revision 2) – IEEE Std 308-1974. OUTDATED
- Draft Regulatory Guide (DG-1079) was issued in May 2003 for public comment
- Comment period expired July 31, 2003
- Received one comment letter

Criteria for Power Systems

- Major role of the safety-related power system is:
- To provide electric power to the reactor trip system, engineered safety features and auxiliary supporting features
- Safety-related system is unique – it extends throughout the plant

Criteria for Power Systems

- Scope:
- Applies to
 - (1) Alternating current power systems
 - (2) Direct current power systems
 - (3) Instrumentations & control power systems

Criteria for Power Systems

- Principal design criteria
- Safety-related power systems shall be designed to assure:
 - That no DBE causes the following:
 - A loss of electric power to a number of engineered safety features, surveillance devices, or protection system devices – so that a required safety function cannot be performed
 - A loss of electric power to equipment that could result in a reactor transient

Criteria for Power Systems

- IEEE Std 308-2001 provides
 - Principal design criteria
 - Requirements for tests and surveillance
 - Criteria for sharing safety-related power systems in multi-unit stations
 - Requirements for documentation, including verification and validation

This Regulatory Guide endorses IEEE Std 308-2001 with a minor exception, namely

DC systems will not be shared in multi-unit stations
(Regulatory Guide 1.81)

Criteria for Power Systems

- Significant Changes since 1974
 - Guidance was included:
 - (1) Design basis for safety-related power systems
 - (2) Application of single-failure criteria
 - (3) Connection of non-safety-related loads to safety-related buses
 - (4) Independence of safety-related power systems

Criteria for Power Systems

- Requirements for circuits that penetrate containment
- Pre-operational testing of safety-related power systems
- Multi-unit station considerations
- Surveillance requirements for safety systems

(9) Consistent with IEEE std 603

(10) Criteria for Interfacing with other IEEE Stds

IEEE Std 765-1983

- IEEE Std 741-1990

- IEEE Std 387-1984

- IEEE Std 946-1985

Criteria for power quality to include potential effects of

- (a) Harmonic distortion

- (b) Degraded grid conditions