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NUCLEAR REGULATORY COMMISSION

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507TH MEETING

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS (ACRS)

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WEDNESDAY, NOVEMBER 5, 2003

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ROCKVILLE, MARYLAND

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

COMMITTEE MEMBERS:

MARIO V. BONACA	Chairman
GRAHAM B. WALLIS	Vice-Chairman
STEPHEN L. ROSEN	Member-at-Large
F. PETER FORD	Member
GEORGE E. APOSTOLAKIS	Member
THOMAS S. KRESS	Member
GRAHAM M. LEITCH	Member
VICTOR H. RANSOM	Member
WILLIAM J. SHACK	Member
JOHN D. SIEBER	Member

ACRS STAFF PRESENT:

MARVIN D. SYKES	
JOHN T. LARKINS	Executive Director-ACRS/ACNW
SHER BAHADUR	Associate Director-ACRS/ACNW
HOWARD J. LARSON	Special Assistant-ACRS/ACNW
SAM DURAISWAMY	Technical Assistant-ACRS/ACNW

PRESENTERS:

SATISH AGGARWAL	NRR
AMRITPAL GILL	

NRC STAFF PRESENT:

SHERRY A. MEADOR

SAMUEL HERNANDEZ

NILESH C. CHOKSHI

JIENDRA VORA

ALLEN HISER

I-N-D-E-X

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

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

1.2) ITEMS OF CURRENT INTEREST

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

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

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

MEMBER SIEBER: Thank you, Mr. Chairman.

2) DRAFT FINAL REGULATORY GUIDE 1.32, REVISION 3, "CRITERIA FOR POWER SYSTEMS FOR NUCLEAR PLANTS"

2.1) REMARKS BY THE SUBCOMMITTEE CHAIRMAN

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

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

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

MR. AGGARWAL: Thank you, John.

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

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

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

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

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

The comment period expired on July 31st,

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

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

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

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

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

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

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

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

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

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

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

MR. AGGARWAL: That's right.

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

MR. AGGARWAL: No sir.

MEMBER LEITCH: Okay. Thank you.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

MR. AGGARWAL: Essentially.

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

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

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

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

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

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

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

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

you, when you would like the load to be disconnected." And that guidance is included in 2001.

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

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

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

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

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

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

MEMBER LEITCH: It's based on?

MR. AGGARWAL: Current design.

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

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

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

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

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

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

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

MR. AGGARWAL: That's right.

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

MR. AGGARWAL: We will create probably more --

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

MR. AGGARWAL: Yes. Probably --

MEMBER LEITCH: It was never built, but it

had a construction permit, I think.

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

MEMBER SIEBER: Right.

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

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

MR. AGGARWAL: Basically.

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

MR. AGGARWAL: That's right, John.

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

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

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

MR. AGGARWAL: That is correct.

VICE-CHAIRMAN WALLIS: All right.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

MEMBER SIEBER: I have --

MR. AGGARWAL: Yes, sir?

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

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

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

MR. AGGARWAL: Sure.

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

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

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

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

MEMBER SIEBER: That's right.

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

MEMBER SIEBER: That's right.

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

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

MEMBER SIEBER: Right.

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

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

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

the distortion there because there is no DC power.

MEMBER SIEBER: Right.

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

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

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

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

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

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

happy marriage.

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

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

MEMBER ROSEN: Okay.

MR. AGGARWAL: Thank you.

Any other questions?

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

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

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

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

MEMBER SIEBER: That's right.

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

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

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

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

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

They have not done that this time to the

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

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

MEMBER LEITCH: Or reaffirm.

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

MEMBER LEITCH: Yes.

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

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

(No response.)

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

CHAIRMAN BONACA: Thank you.

MR. AGGARWAL: Thank you very much.

CHAIRMAN BONACA: A good presentation.

MR. AGGARWAL: I think you will have a

little longer lunchtime now.

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

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

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.

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