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NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

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FUKUSHIMA SUBCOMMITTEE

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WEDNESDAY

SEPTEMBER 18, 2013

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ROCKVILLE, MARYLAND

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The Subcommittee met at the Nuclear Regulatory Commission, Two White Flint North, Room T2B3, 11545 Rockville Pike, at 1:00 p.m., Stephen P. Schultz, Chairman, presiding.

COMMITTEE MEMBERS:

STEPHEN P. SCHULTZ, Chairman

J. SAM ARMIJO, Member

SANJOY BANERJEE, Member

DENNIS C. BLEY, Member

JOY REMPE, Member

MICHAEL T. RYAN, Member

GORDON R. SKILLMAN, Member

NRC STAFF PRESENT:

WEIDONG WANG, Designated Federal Official

RAJ AULUCK, NRR/JLD/JPSB

JEROME BETTLE, NRR/DSS/SCVB

ROBERT DENNIG, NRR/DSS/SCVB

NAGESWARA KARIPINENI, NRR/DSS/SCVB

TIM McGINTY, NRR/DSS

ALSO PRESENT:

PHIL AMWAY, CENG

RANDY BUNT, Southern Nuclear

PATRICK FALLON, DTE Energy

JEFFREY GABOR, Erin Engineering

STEVEN KRAFT, NEI

GREGORY KREUGER, BWR Owners Group

THOMAS PARKER, Excel Energy

A-G-E-N-D-A

P R O C E E D I N G S

(12:57 p.m.)

CHAIR SCHULTZ: This meeting will now come to order. This is a meeting of the Fukushima Subcommittee, a standing subcommittee of the Advisory Committee on Reactor Safeguard. I'm Stephen Schultz, Chairman of the subcommittee.

ACRS members in attendance are Joy Rempe, Dennis Bley, Sam Armijo, Mike Ryan, Gordon Skillman. The Designated Federal Official is Weidong Wang. In this meeting the subcommittee will review the development of interim staff guidance, for compliance with commission order EA-13-109.

Issued in June, this is an order modifying licenses with regard to reliable hardened containment vents capable of operation under severe accident condition. It applies to all operating boiling water reactors with Mark I and Mark II containment.

In large part, this staff guidance endorses the industry report prepared by the NEI Filtering Strategy Working Group, NEI 13-02. This afternoon we will hear a presentation from the NRC staff, and from the representatives from the NEI working group.

We have received no written comments or requests for time to make oral statements from members

of the public, regarding today's meeting. The entire meeting will be open to the public to attendance.

The subcommittee will gather information, analyze relevant issues and facts, and formulate proposed positions and actions, as appropriate for deliberation by the full committee.

The rules for participation in today's meeting have been announced as part of the notice for this meeting, previously published in the Federal Register. A transcript of the meeting is being kept, and will be made available as stated in the Federal Register notice.

Therefore, we request that all participants in this meeting use the microphones located throughout the meeting room when addressing the subcommittee. All participants should first identify themselves, and speak with sufficient clarity and volume so that they may be readily heard.

We do have participants on the phone line this afternoon. To effectively coordinate their participation in this meeting we will placing the incoming lines on mute until the public comment period near the end of this meeting, unless there's some reason the presenters at the meeting need to call on individuals who are on the phone.

This meeting is preliminary to a session we plan to hold at the next full committee meeting on October 2nd. Pending the full committee deliberations we anticipate writing a committee letter at that meeting.

This work constitutes a very important step leading to improving civil reaction and response for BWRs with Mark I and Mark II containments. And additional steps are going to follow this presentation today, in Phase II of the work. We will now proceed with the meeting.

Since the interim staff guidance endorses, with clarification and exceptions, the NEI guidance document, we're going to begin the agenda with a description of the details of the guidance by industry representatives. And then follow with staff remarks and their direction within the interim staff guidance.

First I'd like to call on Tim McGinty, from the staff, a Director within NER/DSS, to lead us in these discussions with opening remarks. Tim.

MR. MCGINTY: Thank you, Steve. Good afternoon. My name's Tim McGinty. I'm the Director of the Division of Safety Systems, in the Office of Nuclear Reactor Regulations.

I'd like to thank the subcommittee members

for this opportunity to engage in a public dialogue regarding the cooperative industry and staff effort to develop an interim staff guidance to install reliable hardened vents, that are severe accident capable, for BWR Mark I and Mark II containments.

First you'll hear a presentation by industry that includes the functional requirements, including severe accident elements, design attributes, and areas to achieve alignment with the staff that still remain, including anticipatory venting.

The staff is going to follow with an overview of the commission's direction and the June 2013 order. Over the last six months the staff has worked closely with NEI and the BWR Owners Group, on the industry development of NEI-13-02, the Industry Guidance for Compliance with the order.

Staff agreed to review and endorse to the extent possible a guidance document for the severe accident capable, reliable hardened containment vent system. Implementation of the order is divided into Phase I and Phase II.

Current work is for Phase I, which is a capability to vent from the wetwell. Phase II is for a drywell vent, or alternative venting strategies that would obviate the need for a drywell vent. Phase II

and rule making work are to proceed concurrently because of the nexus between the two.

Significant work has been done in the development of an interim staff guidance that addresses Phase I work. At least a half dozen public meetings and webinars have taken place between the NRC's staff and industry, with presence and comments from and by other stakeholders.

The meetings took place in a cordial atmosphere, with open exchange of ideas. With the result that a significant amount of consensus has been reached. A few items still remain to be worked out as the staff and industry continue to meet.

The challenge faced by both the industry and the staff is that, as a result of the commission's direction in the SRM for SECY-12-0157, the actions to be taken are divided into three parts. The first two parts being Phase I and Phase II of the sever accident capable vent system. And the third part being the rule making.

It has been quite a task to maintain boundaries between the three parts. Recognizing that there is interdependency between them all. Given this condition, the staff appreciates the industry's efforts in making progress towards order implementation.

And with that said, I wanted to again say that I'm looking forward, that the staff is looking forward to providing the subcommittee the information that they can consider to support the full committee meeting in October. And I turn it back to you, Steve Schultz.

CHAIR SCHULTZ: Thank you, Tim, for a very comprehensive introduction to today's meeting. With that, I would like to turn over the first portion of the meeting to Steve Kraft from NEI, to lead us through the industry presentation and discussion.

MR. KRAFT: Thank you, Mr. Chairman. Chairman Schultz, Chairman Armijo, members of the committee, we appreciate your kindness in inviting us to speak with you today, on a topic of great importance to the industry, and to the NRC. That is the industry guidance to implement the modified hardened vent order.

As you can see on our first slide. Please advance the slide. Oh, you're doing that. Thank you. I thought there was someone else.

MALE PARTICIPANT: You had to wake me up. Sorry.

MR. KRAFT: As you can see on our first bullet, we wish to associate ourselves with the remarks of Tim McGinty on the cooperative nature of this

endeavor.

I've been involved in numerous efforts, long before the Fukushima accident, in these kinds of activities. And, you know, some are smoother than others. And I think this one was particularly smooth and workmanlike endeavor, in that as Tim mentioned, there are some open items.

We will discuss them with you. NRC staff will discuss them with you. We then have other meetings scheduled to attempt to come to alignment on those items. Numerous exchanges and public meetings.

I think the word numerous understates the number of times we got together. And I want to say how much I appreciate NRC staff's senior management's attention to this. There were, in addition to Tim, there were a number of other individuals coming in and out, paying attention, asking questions.

And we have been reporting both to our senior management and to NRC's senior management, that this has been a very fruitful endeavor. The industry is working toward a common design, or I should say, design elements implement the order. So I think that you'll see through the owners groups activities in the future, some of that activity.

This is a good point for me to stop and make

some introductions. First, let me point out that while this presentation is on behalf of NEI and the BWR Owners Group, I want to point out that the relationship between the BWR Owners Group, NEI and even the PWR Owners Group, are all seamless.

Every domestic member of the BWR Owners Group is a member of NEI. As you see here in front of you, my colleagues from the industry, and others in the room are on both sets of committees. And I think in this instance it would be hard pressed to tell you the difference, you know, when one person is from one and one person's from the other.

Everyone has the best interest of the entire enterprise at heart. And I mean that in the broadest sense. So with that, I will let my colleagues introduce themselves, indicating name, their title, and how they fit in to the post Fukushima activity. Tom, we'll start with you.

MR. PARKER: Sure. My name is Tom Parker, and I work at the Excel Energy Plant in Monticello. I've been involved with the Fukushima effort there for the last couple of years. And I'm the Chairman of the BWR Fukushima Response Committee.

MR. KRUEGER: Good afternoon. My name is Greg Krueger. I work for Exelon. I'm currently the

Risk Management Director for the fleet at Exelon. I serve as the Chairman of the Containment Strategy Subcommittee, working for Tom, for the Fukushima effort.

MR. GABOR: I'm Jeff Gabor. I work for Erin Engineering. We're actually working with EPRI to provide the technical support to both the implementation of a severe accident capable vent, and the rule making on filtering strategies.

MR. BUNT: Randy Bunt with Southern Nuclear. I work with our Severe Accident Management Group at Southern Nuclear. And have been involved with it since the Fukushima event back in 2011. And I'm the Vice Chair of the Fukushima Response Committee, for the BWR Owners Group. And part of the, Vice Chair for the Containment Subcommittee.

MR. KRAFT: So you see, we have here bonified members of both the industry at large, and officers of the BWR Owners Group. We are joined in the room by several other individuals.

As questions come up, depending upon how we, you know, think they ought to be answered, you may call on one of these other individuals in the room here. And before I turn it over to Greg to present the bulk of the information, let me just pick up something that Tim pointed out.

Our presentation is really in three chunks. There is the discussion of NEI 13-02, the bulk of which will be delivered by Greg. We then have some other items that we want to discuss, that have, as Tim said, a nexus to this activity. But not necessarily completely on point with that activity. That being participatory venting, which Tom will discuss.

And then, because of the importance of, and the connection of the rule making to the order, Jeff Gabor will then go through a very brief discussion on where we are in our views on how that rule making should progress. So with that, unless there are questions on the general statements we have made, I would turn it over to Greg.

MEMBER ARMIJO: I have a question.

MR. KRAFT: Yes, sir.

MEMBER ARMIJO: The group there, you're sort of, you're the leadership of this activity. But how deeply into the industry do you get input? I know where you guys --

A number of different plants, with a number of different arrangements and, you know, operations and engineering people in those different plants have perhaps different problems. How do they, have they contributed to the development of this? And if so, how

do they work? How does this all come together?

MR. KRAFT: Let me take a crack at that. And then if I have to turn it over to, I guess Tom. Because I think he's probably closest to some of this. The BWR Owners Group is really the key to everything you just asked about.

And the reason being that, yes, these other people have been directly involved. We get input in every manner possible. All the documentation has been reviewed by the owners group. I'm saying it right, aren't I, Terry? Has gone through the owners group.

There are committees galore in the owners group and NEI. So the detailed information up and down comes through the owners group. However, the other question is, the industry's leadership on post Fukushima, and all issues nuclear.

Through our chief nuclear officers we have a Fukushima response steering committee, that is actually going to meet with the NRC steering committee tomorrow. And they direct what this, and other groups like us, do in the post Fukushima response. It is made up of about a third of the CNO cadre in the industry.

They report to a group called the Nuclear Strategic Issues Advisory Committee, NSIAC, at NEI, which is all the chief nuclear officers. There are

other related committees. EPRI has a group, it's called the Power Council. INPO has a group, it's called the Executive Advisory Group.

It's all the same people in different formations. The answer there is, everyone has to be in their swim lanes. INPO has a role, EPRI has a role. And it has a role with the owners group also.

MEMBER ARMIJO: Yes, Steve, I think I understand that.

MR. KRAFT: But my point is that information --

MEMBER ARMIJO: Down to the trenches.

MR. KRAFT: I'm saying --

MEMBER ARMIJO: That's what I'm interested in.

MR. KRAFT: That's my point. Information flows to the trenches both ways. From us to the owners group, out to the engineering operations staff, up through the CNOs, and out through their connections in their own plant. So the operations and engineering people are hearing it in two ways.

They're hearing it from the owners group, but their bosses are also telling them, that's the way I want it done. So you're seeing that happening from both perspectives. And so it's actually a pretty

effective way of doing it.

MR. KRUEGER: This is Greg Krueger. To answer, or amplify Steve's answers, we've had active operations staff with licenses. We've had design individuals that understand piping design, valve design, engineering, licensing. All of those individuals brought together on to the committee.

MEMBER ARMIJO: Well see, that's what I was getting at. They guys down in the trenches that know their plants.

MR. KRUEGER: Right.

MEMBER ARMIJO: Say they either have terrific ideas, that might turn out to be best practices. Or, saying, you know, what you're proposing just won't work for my plant. You're putting me in a box that I can't get out of.

MR. KRAFT: That information is flushed up through the owners group. And so, since you've asked more detail. In November, in addition to an industry workshop on implementation of the order, on November 12 and 13, we will also then, the following day and a half, have an engineering workshop, sponsored by the owners group, to get into those very detailed --

MEMBER ARMIJO: Okay.

MR. KRAFT: -- nuts and bolts. So we are

trying to get, you know, touch everyone we have to touch in all of this activity. So I have to say, it's pretty comprehensive from where I'm sitting.

MEMBER ARMIJO: Okay, very good. Thank you.

CHAIR SCHULTZ: But, Steve, that step is still coming up. That is to say, is this a workshop that's being proposed --

MR. KRAFT: Yes. The workshop on the 12th and 13th in Baltimore will be a discussion of the order and implementation of the order, to the level, I suspect, of what's in NEI 13-02.

Then the next step would be the engineering discussion, which the owners group will take on. But it will happen the following day. So there's no loss of momentum in this discussions. We haven't really worked out the agenda, you know, fully.

We'll be inviting NRC staff, of course, and yourselves if you'd care to join in that, for that meeting. But that's -- And we've done this before. We had similar workshops on implementation of all the original Fukushima orders.

We've had a specific workshop on FLEX, which is our way of implementing 049. So this is a, you know, one of many sort of steps that we do in this way.

CHAIR SCHULTZ: Maybe we'll address it later with either Greg's comments or Jeff's. But what I'm interested in hearing is whether the group feels at this point in time, whether the review of the NEI 13-02 approach has been fully vetted within the group, to the level of the individual utilities that are going to need to --

MALE PARTICIPANT: Think tank.

CHAIR SCHULTZ: -- implement it. And whether the response had been, if you will, all but unanimous to be able to support the guidance going forward.

MR. PARKER: We've been working for what, probably the last six months. And we've had a lot of chance to get feedback from individual utilities. I think to kind of amplify on Greg's amplification, that having two active SROs on the actual group that was developing and reviewing this ISG, was extremely valuable to the group, to make sure that we haven't forgotten some of the end users.

MR. BUNT: I'm sure. Randy Bowman. To further answer your question, in a meeting in late July we went over all of the active sections at that time with a group of 35 to 40 members from our sites that were participatory into it.

And we spent a whole day going through the details of it. They had a copy of the document. We got feedback back from them and adjusted those, incorporated those comments in that going forward. And in the follow up meeting with the NRC staff to show those comments, and all.

CHAIR SCHULTZ: Thank you. Okay, Greg, why don't you pick it up.

MR. KRUEGER: Okay. With that, this is Greg Krueger. We're going to step through some functional requirements and some design attributes, and not go through the entire document. But try to step back and hit on some key elements here.

The unique challenge here is that this is an engineered feature we're putting into the facility, that has to remain functional and operational in a sever accident environment, which is well above and beyond what typically we have engineered before.

And so that makes it very unique and challenging, in terms of trying to define what parameters we should design to, how to address some of the unique issues that come along with sever accidents.

So one of the functional requirements is obviously severe accident capability. And that is to make sure that should we have a core damage event, which

does generate hydrogen and radionuclides, and temperatures above those of saturation, that in fact, the vent would perform its function.

In other words, relieve the pressure from containment, as well as the constituents that come along with a core damage event. And, you know, the intent here -- And we'll get to a diagram later to look at how we believe these will translate into actual design requirements. But certainly that puts a limit on the ability of the vent, and what it can and can't do in relation to the containment.

Of course, one of the requirements is to limit containment pressure, or over pressurization, as a result from either loss of decay heat removal, or an extended ELAP, or some other type of beyond design basis event.

And that's to limit both the pressure and containment itself, to make sure that we have a controlled engineered feature that could relieve pressure, rather than the containment failing in an unknown location. As well as being able to control pressure to make sure that we could reduce it, such that we could inject with low pressure systems, or use other means of injection to protect the core.

So there's a multi modal design that we have

to consider when we move through the design steps here. Again, what's unique here in 109, relative to the older order, is that we have to show venting capability both from the wetwell and from the drywell under ELAP conditions.

What I'll say, the old order from last year was very focused on wetwell venting under saturated conditions. And by expanding the scope here to severe accident capability, venting from the drywell and some of those conditions that you might see certainly provides a much different challenge.

The fourth bullet, control the use of common systems within the plant and between the units. That's a key insight from the events at Fukushima a few years ago. It was evident that hydrogen moved from one place to another.

Obviously, that is not where we want an engineered feature, or we don't want an engineered feature to fail in such a way that that would occur again.

So consideration of any interfaces between systems, because we are dealing with ventilation systems here, and the connection of those ventilation systems to containment. And normal systems needs to be prevented, as well as any connection between the units.

When we look back at Generic Letter 89-16,

the original hard pipe vent for the Mark I, the focus of that was to remove decay heat, assuming that it was occurring on one unit. The vent, and all the functional requirements that are contained within this document, understand that we can have a site event, not just a unit event.

And that we would need to simultaneously vent from potentially multiple units, not just unit. And therefore the connections would have to be sized such that you could do that. Or you would have to have separate event paths.

MEMBER SKILLMAN: Greg, on your bullet 3 --

MR. KRUEGER: Yes.

MEMBER SKILLMAN: -- as you well described. The piping in the valves need to be designed for a wide range of functional performance requirements.

And what we learned at TMI 2, is that the utilities themselves weren't really equipped to make many of the hardware changes. They went out and bought circuits.

To what extent is fulfillment of bullet 3 going to test the resources that are available for the changes for the Mark I and Mark II containments? In terms of either architect-engineer support, or in house

engineering capabilities.

MR. KRUEGER: What we're trying to do is recognize that there are limitations. And that we need to be specific. In other words, yes, if left too broad the understanding of severe accident conditions, and what that might mean with regard to buying or designing a valve or a vent, is not that well know across the industry or the architect-engineers that might be involved.

What we're trying to do is provide specific design points or limits, or conditions to make sure that we can meet the function. In other words, we'll talk later about drywell temperature, a selection of the drywell temperature.

That selection is there knowing that from a valve and piping stand point we can design to that control point, even though the capability of those components might be much greater than that.

So we're trying to, through the use of very specific items within this document, as well as appendices, is to try to think of all of the possible permutations and conditions that people would have to design to. So that we can box that in a little better than maybe we have had in the past, in response to other events.

MEMBER SKILLMAN: Okay. Well let me just pull a little bit further --

MR. KRUEGER: Sure.

MEMBER SKILLMAN: -- on this string. These plants, many of these plants are old. Some are pre-DDC. And consequently the newer plants have a code data record. And the designers know exactly what portion of ASME to begin at the piping systems. And some of the older plants probably were hit and miss in some of this plan.

And so my question is, how is the modification envisioned by your team, so that the plants end up with a robust treatment of this piping that is in accordance with their license, that doesn't take them to a new design space that they don't need to be in?

MR. KRUEGER: Yes, that is a challenge. There's a spectrum across the fleet, as you well imagine, given the age of some of the units, from a BWR 2 Mark I, all the way to, you know, the newer Mark IIs. And the design requirements are different.

We do have some global statements, obviously, with regard to making sure unique GDC requirements for containment isolation understand what those are. In some cases I would imagine there might have to be evaluations, given the lack of understanding,

or traceability of where, you know, that particular containment penetration or valve might be.

What's called a resurrection of a design to make sure that it's clean, before we tap off and then go forward with the vent. So, you know, I don't have a lot of specifics for you. But certainly that's --

MEMBER SKILLMAN: So this is envisioned --

MR. KRUEGER: That wouldn't be a challenge.

MEMBER SKILLMAN: This is envisioned in your documentation?

MR. KRUEGER: Yes, we have, when Steve talked about some common design elements within the BWR Owner's Group, in addition to this document we are not only having meetings but trying to develop other tools such that we can provide the correct instruction and information to the broad set of BWRs rather than having each plant trying to figure it out themselves on those elements. So there's going to be information well above and beyond that just that's contained in the NEI Guide.

MR. KRAFT: I don't know that we mentioned this, but there will be a separate BWR Owner's Group Engineering Guidance. I think I did mention it that we would get into some of these details, because the questions, there are obvious questions about you don't want this all over the lot.

You don't want it all over the lot just not from the standpoint of what are the best practices which is a primary driver, you want to make it as standardized as possible for NRC review and inspection. Because, you know, different inspectors, different guidance sometimes leads to different results plant by plant and that doesn't help anybody -- NRC or the industry. So there will be a lot of that work.

If you look at the example most recently in implementation of FLEX, I think the idea that there are, you know, standard connections, standard, down to a standard, you know, screw fittings and threads and things like that all come out of that. The use of FAQs.

It wasn't necessary in the spent fuel pool instrumentation order. That was a fairly simple comparison to a lot of these. There was a lot of commonality as a result of certain market conditions but I can say that relative to instrumentation, but that's not the same thing. So I think there's going to be a great deal of that kind of help to the individual utilities.

But there is variations. We've been told that there are Mark IIs that just don't have the kind of vent we're talking about and they're going to have to go through a lot more. We have plants -- Greg has

told me about a couple of his plants where the piping run for the -- you know, when we put these vents in in the first place for the Mark Is, you found the pathway.

Well, that means you've got a lot of turns and angles and elbows that are hydrogen tracks. It's going to have to be changed. You want straight, clean lines to avoid that problem. That doesn't necessarily apply in every single plant, right, those are a plant by plant bases.

And I don't know whether, I've not been that engaged with the Owner's Group over the years, but I would be surprised if there aren't plant visits made, you know, when we get down the line which you don't want people creating more problems for themselves or misreading the guidance or anything like that.

CHAIR SCHULTZ: Okay. Greg and Steve, thank you. Okay.

MEMBER REMPE: I had a question related to containment accident pressure. The NEI document does acknowledge that it will be incorporated if this goes forward but there's no details. And we recently ran it in EPU to Monticello, and I was just kind of -- with a containment accident pressure credit being given. And I just wondered if you had any additional details about the discussions on how that will be addressed.

MR. KRUEGER: I don't know if you want to talk about --

MR. PARKER: Tom Parker. The procedure that we'll talk a little bit later about that we're going to use to actually open the vent will have protection in it to make sure it's not opened at the incorrect time. So, for example, in the LOCA it wouldn't be allowed to be opened because you'd have RHR pumps available to remove the decay heat so there would be no need to open the vent, and the procedures would not permit it under those conditions.

MEMBER REMPE: So there will be some thoughts given to the various scenarios, and they require it and the operators will have specific procedures that will stipulate when you can and can't?

MR. PARKER: For example, in our EOPs there's a specific discussion in there about net positive suction head for RHR pumps.

MR. KRAFT: This actually touches on a lot of the discussion we've had in anticipatory venting with the NRC staff in terms of the vent being open, you know, in anticipation of one scenario, but then all of sudden the scenario takes a turn, right, and can you get that vent closed, and those sorts of things.

And we're working through a white paper that

describes how that would work out. Tom's area. So no, this is something we're very well aware of. Lots of different modes here you had to be very careful of, right.

MR. KRUEGER: Well, that's the real challenge. There are a number of sequences or paths you can go down and beyond design basis accidents or severe accidents, and not inadvertently impacting one type of sequence or one series of sequences but designing something, you know, for the achievement of another sequence.

So the balance is what I think is challenging. That's why I say it's a very unique challenge to try to put together a document such as this to balance all of those attributes.

MEMBER BLEY: Some of the things you folks talked about included possible visits to the plant, possible -- well, we have impacts on operations, operating procedures. How is INPO factored into what's going on here? Are they part of the group somehow or are they just going to see it when you're done and incorporate it into what they do when they come out to visit plants?

MR. KRAFT: INPO is not part of this group. They were invited, but I think INPO focuses more on,

as we say, after the fact. But they are working on a major, what we call an IER, of picking up all the Fukushima activities to take, you know, the plant where it's beyond just NRC requirements. I'm not real familiar with all the details of that Greg. I don't know if you've been --

MR. KRUEGER: No. But again INPO's role is much focused on operational excellence. So we're focused on the design and --

MEMBER BLEY: Developing things that will impact operations --

MR. KRUEGER: Yes.

MEMBER BLEY: -- and things they would inspect or those they'd want to see. But they're just at most observing or just waiting --

MR. KRUEGER: At the moment, in this case. Correct. I would expect more involvement as we move further down the line.

MEMBER BLEY: Okay, thanks.

MR. KRUEGER: And the last bullet on this slide addresses all venting modes. In many cases, you know, we're using existing penetration. That existing penetration already has a function. It might be a function to DNR containment that goes through the stand-by gas treatment system, and it might be teeing

off between the containment isolation valves to then form the new vent path.

But there are multiple missions for this vent that we also have to consider. Already mentioned was the anticipatory venting, and Tom will talk to that a little bit. But then there's venting pre-core damage to reduce the pressure such that we can get low pressure injection systems to inject.

There is a venting under severe accident conditions which is a different venting mode, if you will. And that there's venting to limit total offsite dose by venting the containment and allowing what I'll call a pressure band to exist to absorb some type of future event that might occur.

So there's multiple layers that go into trying to figure out how to best design the pipe and not inadvertently, as mentioned, impact, you know, some of those other modes.

CHAIR SCHULTZ: You've outlined a number of challenges.

MR. KRUEGER: It's a number of challenges.

CHAIR SCHULTZ: I look forward to the next slide.

MR. KRUEGER: Moving on to the next slide, as already mentioned by the NRC, this is a two-phased

approach. We're focused mainly on the wetwell vent at the moment. However, we did include information relative to the conditions within the drywell because there will be some common portions of the piping, and obviously we have to consider or at least recognize the fact that those common portions could see those elevated temperatures on the, what's called the back side of the wetwell vent valve.

So felt it necessary to at least have some description and criteria set forth from a drywell temperature perspective to make sure that from a design we're considering that potentiality as we move forward in the first phase.

The second is we, you know, took awhile and maybe struggled a little bit about the design versus capability of system components. Certainly you can design to a given parameter. In a beyond design basis world, the severe accident world, we're looking more best estimate than we are a conservative bounding evaluation.

And how do you best design the components or the pipe to be able to meet the functional requirements, and how do you account for the capability? Many engineered features, whether they be in a nuclear facility or maybe even outside in the rest of the world,

are overdesigned from an engineering perspective. You can design to a point knowing that the capability of those components actually does exceed beyond that point. And how do we measure that or take credit for that additional capability when designing it such that we don't set the design criteria or the parameters at a very extreme condition and basically are looking for valves that can withstand 1,000 degrees?

I mean that's really what we're dealing with here, struggling with, is how to bring that back to something that's reasonable from a design and purchasing standpoint and yet still allow its functionality to occur beyond that point.

And so we're going to have to deal with obviously a hydrogen generation from a severe event which is unique. Steam is different than hydrogen in terms of leakage across boundaries. Obviously hydrogen being, hydrogen deflagration detonation is of concern within the pipe itself.

Even though there may have been a reasonable hydrogen and nitrogen mix within containment, once the hydrogen moves through the pipe to another location that mixture could change with regard to oxygen. Now we have to consider where in the pipe, you know, we might have to deal with a detonable mixture that may not have been

detonable, actually, in the containment itself.

Core concrete interaction brings radionuclides, brings all types of aerosols that come along with the flow stream that are very unique. That are well beyond in what we would normally consider from a steam type system.

And then obviously higher temperatures in saturation and radiation levels. As already mentioned, where's the pipe go? You know, where it goes matters because now you've got radiation. In the past, or under Generic Letter 89-16, we were dealing with temperatures and maybe high temperatures around 350 degrees, but we weren't dealing with, you know, radiation that might come along with a core damage type event or some core degradation event. So very different in terms of design and where you put the pipe and where it goes.

Last, we did take a quote from the order and specifically criteria 1.2.10 which is that the hardened containment vent system, shall be designed to withstand and remain functional during severe accident conditions understanding the conditions that might occur, but it's not required to exceed the current capability of the limiting containment components.

And we've provided a diagram a little later, a few slides later, to try to go over conceptually how

we're moving in that direction and trying to map out how best to pick those design points.

MR. KRAFT: I just want to emphasize that when we worked with NRC on the order, the word "capability" was very carefully used. It's not design, it's what's capable. And you'll see that reflected in some other information going forward. Just wanted to highlight for the committee.

MR. KRUEGER: Design attributes. Of course, within the document there are a long list of design attributes and the NRC slides do get into a little more detail with regard to these. But some of the high level ones -- simplified operator actions with redundant controls.

It's key, now that we're dealing with these kinds of conditions already mentioned from a severe accident standpoint. You're not going to be standing next to the vent pipe. You're not going to be operating the vent, you know, physically right at the valve.

There are stand-off distances or designs that have to be employed to make sure that the operators -- this is a manually initiated system as is all decay heat removal for BWRs, so it's a manually initiated system and you have to have not only the engineering available to make sure that it occurs, but make sure

the operators can do that in a reasonable matter.

Inadvertent actuation. That's a topic that's come up in the past. Again, we don't want an inadvertent actuation of the vent to occur when it isn't required to occur or at the wrong time. So we also have to build in key lock switches, potentially rupture disks or other types of engineering functions to make sure that that does not inadvertently occur, you know, when we don't want it to occur.

Again, one of the key functional attributes here is we not only want to vent, we want to vent when we understand it's best to vent. And that's not all the time in a specific sequence or scenario.

And habitability, we have a section, Section 6 within this document that goes through some of the habitability/accessibility concerns in terms of minimizing time for the operators at the vent controls. Even though they might be a stand-off distance, there's still limitations with regard to where you go and how you do it and how much time you spend.

The prevention of cross flow, already mentioned between building systems and units. That is obviously key in moving forward. And the reason we've got this as a higher level design attribute is, for many dual unit sites the standby gas treatment system is

shared between the two units.

And under the Generic Letter 89-16 designs, some of those designs were just bypassing the filtration trains which is a common element, and it's recognition that, in fact, that might not be the best type of design moving forward in trying to implement the 109 order.

Protection from flammable gas ignition both from a hydrogen perspective and a CO perspective should there be core concrete interaction. There is considerable discussion within the document relative to that as well as a separate appendix on hydrogen and how to calculate hydrogen deflagration detonation and understand how to design the pipe should you have that within the pipe.

Randy, do you have anything to add on that in terms of attributes?

MR. BUNT: Only that we're looking at it and we understand it's one of the areas that we need discussion on is the instrumentation and the ignition sources for the instrumentation for some of the key elements out there to make sure that they are protected so the instruments continue to perform at the function we understand is going to continue to work on meeting the right criteria established for that.

But we do look at the environment around

it as well as the dynamics that go along with the hydrogen flow and possible deflagration that may happen in the piping.

MR. KRUEGER: A couple of other bullets here. Initial 24-hour --

CHAIR SCHULTZ: Just a moment. How broad is your definition of protection with regard to flammable gas ignition and protection from that could imply addition of systems associated with hydrogen control, and is it meant that way here?

MR. BUNT: It's not meant that way here. What we're looking at here is protection of the components inherent that are part of this vent system. An example would be for the rad monitor that's going to be utilized for the vent system to have the appropriate, namely, explosion-proof enclosure for that connectivity would be an area that we've got open for discussion with the staff going forward as to how do we look at that not only in terms of the piping, then also looking at the dynamic loading that would be for the instrument gives for something that's internal to the piping system to make sure that that can respond to any type of perturbations that may happen internal to the pipe.

That's what we mean by here it's talking

about the vent system itself, but not the tier 3 item still out there to look at the hydrogen control in the buildings provided that there was some leakage at that point.

CHAIR SCHULTZ: Thank you.

MR. KRUEGER: The order requires initial 24-hour operation with installed equipment. That basically means the power and air supply, should you have air operated valves, is sufficient to maintain that without additional, you know, outside equipment being brought in.

However, there's a recognition that venting is not necessarily just opening once and closing it. There could be longer term implications with regard to venting following a severe event, and that there's a need for longer term operation or at least a design such that we can hook up alternate instrument air, alternate power such that we can continue that operation moving past 24 hours. Not clear where that ends, but certainly past that.

And last, wetwell design that's consistent with the saturation conditions within containment. The only reason that we put this bullet on the slide is to differentiate that from the drywell conditions. We do agree that, and I believe the NRC agrees that the wetwell

design parameters of saturation do apply to that piece of the vent pipe. However, there's still discussion ongoing with regard to the drywell section.

So with that topics for further alignment, and again there's additional information in the NRC slides. But we do align on generally these elements, the design value as mentioned, instrument qualification and what does that mean.

As Randy indicated, we're focused on the instrumentation that is attached and associated with the vent pipe directly and, you know, there's some discussion that still needs to happen with regard to that.

Anticipatory venting, the time we'll talk about in a few minutes. And two items, accident management in terms of use of the EPGs and Severe Accident Guidelines. The reason we have that in there, as mentioned that thing is a manually initiated process. The Emergency Procedure Guidelines as well as the Severe Accident Guidelines, which would be employed in a severe event once you have the core damage, have a number of parameters in which the operator would open the vent on.

And I think it's important to at least reference those to make sure that we got as mentioned

earlier the operations focus in there. This is not just the design of an engineered feature, but it's the interaction between that feature, where you are in accident space, what conditions you're seeing and how you interpret those via the EPGs and SAGs to implement this vent.

So I think that is important to marry those two at least at a high level in the document to make sure that those are aligned.

CHAIR SCHULTZ: So marriage at a high level, is that in fact going to be sufficient? I'm thinking of the level of detail that had gone into some of the preliminary analyses associated with these issues when we were -- and we're still working on the vent filter issue, and a lot of work had been done associated with accident management analysis.

MR. KRAFT: Yes. Yes.

CHAIR SCHULTZ: And we got into a very deep level of activity and discussion associated with the what ifs and the whereabouts associated with that. So to say actually the management at a high level is going to address this, I'm wondering if that's going to be sufficient.

MR. KRUEGER: Right. I would ask Pat Fallon or -- to answer from an operator's or operations

point of view in the interaction of EPGs with the vent.

CHAIR SCHULTZ: If you could just state your name before you begin that would be good.

MR. AMWAY: Okay. Good afternoon. My name is Phil Amway with Constellation Energy, and I'm the Fukushima Fleet Technical Lead with the Fukushima Lessons Learned, and just before that I was a licensed operator at Nine-Mile 2.

So as far as dovetailing of the HCVS, severe accident capable order, in with accident management EPGs and SAMGs, you know, our EOP flow charts are very specific in terms of when you answer in a specific EOP flow charts, and then within the EOP flow charts what actions you would actually have to do to control containment pressure starting off with the least significant actions depending on the event you have to the more significant. And that would include in the subset of actions that are for containment pressure control, the first thing I would do is, can I maintain my containment pressure with normal means?

And as Greg pointed out, this design covers the whole range of capabilities on my vent system which would be the normal vent purge system, the use of standby gas. And that's how we would normally maintain containment pressure, which this system would be a part of and be

connected to, would be through a two-inch line to the GTS, standby gas treatment system.

And then if that action is unsuccessful, then I have to move on to more significant actions which would be my containment sprays. So I would try to spray my suppression chamber first, attempt to make that action work. If I'm unsuccessful I'd move on to the drywell spray feature. That's a more significant action. There's some other checks I'd have to do before I initiate that action.

But in the case of the ELAP, my spray capability does not exist because I don't have power. You know, I don't have the ultimate heat sink. First of all I don't know have the power to power the large pumps. So then beyond that as my containment pressure continues to rise, that's where I'm going to get into the steps that tells me two vents, okay. So now with this vent capability that's how that's going to be interrelated into my accident management strategies, the EPG/SAMGs, and use of the HCVS to actually execute that vent strategy.

MR. PARKER: Maybe I could amplify. Tom Parker. We have a separate subcommittee that works on developing the procedural guidance for all the BWRs, and no one is here today from that committee. They're

in Mexico training operations personnel there.

But they've looked at the events that's happened at Fukushima and come up with lots of good recommendations, and that's part of what I'll be talking about with respect to some of our, what we think of the lessons learned from Fukushima.

But they have been studying the graphs of what's happened there from the data that we do have and trying to develop better procedural guidance based upon the events that happened in Japan. So does that answer your question?

CHAIR SCHULTZ: I think the combination is --

MR. FALLON: Okay, one more. Pat Fallon, licensed operator Fermi 2, and I actually am a back-up, not on the EPC but a back-up for our plant representative with that. And realistically, operators have to have a procedure to be guided on what to do with all these tools that we're creating, whether they're new tools or old tools.

In our case we have an 89-16 vent that we have guidance on when to use that. The ELAP basically takes that away from us. The new vent will eliminate those vulnerabilities of that 89-16 vent. And we have guidance on when to use that now, plus it's a more

advanced tool and can be used further into the SAGs than what we currently have with less impact, if you will.

So we do need to create and use the SAG guidance on it and we don't want to leave an operator in a position where he doesn't have guidance on how to operate something, so we're going to create the necessary procedural tools for that.

The EPC is in the process right now. They're doing a SAG Rev 3 and an EPG Rev 3 where they're going to incorporate the lessons learned out of Fukushima to give us that guidance as operators. Does that answer your question?

CHAIR SCHULTZ: As I said, the combination does, and at least it sets me on the right direction.

MR. KRAFT: Well, also just to cap that we talked about the rulemaking. Once we get through the rulemaking where there will be additional, perhaps, plant modifications, we fully expect another round of changes to the procedures and more training. So it's an ongoing process that's going to play out over by a number of years going forward.

CHAIR SCHULTZ: But the schedule here is a shorter circuit than is the rulemaking.

MR. KRAFT: Correct.

CHAIR SCHULTZ: I understand that's going

to influence. And what I'm trying to get in my head, and I'm sure that the committee is as well, is this is a great example of a number of different features that are coming all together and pointing directly at this project. And it's a very complex web that we're in the middle of here with regard to this work.

I understand other influences will come in, but we've got the first crack that winds up in 2015, and the second piece in 2016, so it's going to be quite a challenge.

MR. AMWAY: Steve, how this interrelates though, I would see this as a step towards that overall strategy. That you have to have this hardware in place to be able to effectively use that filtering strategies that would come out in the EPG site space.

CHAIR SCHULTZ: Right, and the key is the design and implementation of that hardware so that what we think of or what influences us in the future is going, that the design is going to be effective to accommodate that.

MR. KRAFT: Tomorrow at the joint steering committee meeting, the CNOs from our side will discuss what they saw and learned on a trip to Japan last week where we looked at Kashiwasaki-Kariwa, Fukushima Daiichi and Fukushima Daini.

And I was along with them and I'll tell you,

if you haven't done this it's a singular experience to do this. The lessons from Daini have not been mined sufficiently, in my opinion. That is where it worked. We're all too often looking for root causes where it didn't work, let's look for root causes where it did work.

One of the items that we discussed with the CNOs, you know, when we were close proximity for a week with them, that they pointed out to us was that what they noticed in the response at Daini was the integrated, in-depth understanding of how the whole machine works, by in this case the plant superintendent Mr. Masuda, but generally speaking. And the questions they're asking themselves are, are we training correctly, are we giving the right in-depth knowledge, which goes right to your point, Chairman, on how operators respond and what they have to know to respond.

And think for a moment. You start with operating procedures, you get into your, you know, ultimately your EOPs. They're still procedures. This happens -- push that button, turn that handle. And then all of sudden we cross a threshold and you say, okay, now be creative. Here's a couple of bits of guidance, go follow your lines, go, you know.

And the point Pat was making was a really

good one. You've still got to proceduralize it so the operators can follow it, but you also have to be creative enough to figure out what's the right response. And I think that that was a major learning and we'll see that reflected in some way going forward.

To your point, INPO will be involved in that as well, which early days in trying to assemble the full set of lessons learned, but it will be done fairly quickly. And again, tomorrow is the first discussion of that with the NRC steering committee.

MR. GABOR: Additional comment, Jeff Gabor. I'd add that I don't think it was brought up yet is that the plants, the BWRs also have technical support guidance. Which is yet another level of information below the EOPs and the EPG that provides them with, like Steve said, with the flexibility and the ability to assess where they're at, determine where they're at in the accident and determine what the best course of action is.

And something like venting obviously is a pretty serious decision to have to make. But there is guidance provided in the TSGs to help them, help them through that.

MR. BUNT: Randy Bunt speaking. Exactly to your point is why we included a subsection in the

NEI 13-02 document on procedures, but to back to Greg's point, it was more about high levels because we wanted to have the broader people that would be reading that document to understand the procedure interaction.

But as you've heard from everyone else, that procedure in and of itself has a dedicated process, has a lot of review factors and a lot of lessons learned that are being implemented in its own right, in its own process.

And that's what we were saying is from a high level point, for the 109 order, we're just making an awareness and there wasn't any intent for the NRC to indorse that process because it had its own independent process. But we needed to be sure that all the people involved were aware of the interaction and that that's where accident management was happening, was through that procedure interface.

CHAIR SCHULTZ: Thank you.

MR. KRUEGER: And the last bullet here, in terms of topics for further alignment, we did have an Appendix Echo on Generic Letter 89-16. So why have that, that seems somewhat tangential to everything else here.

But it's a recognition that in fact we did install hardened vents for Mark I under that Generic

Letter. I want to make sure that as we move forward in this implementation, that this implementation covers the attributes of what was recorded in that Generic Letter.

In other words, we still need to meet those other requirements for loss of decay heat removal which doesn't assume a loss of offsite power, doesn't deal with some of the other boundary conditions we're dealing with here.

But that was really the intent of Appendix Echo, it wasn't anything more than that to make sure that utilities understood, we still need to meet, sort of like design basis, you still need to meet you other regulatory requirements as we move along.

MR. BUNT: And from a paperwork cleanup standpoint, we wanted to say that we were getting that document off of the table because 109 is a more broader document that carried those elements in it. So instead of just having people to have a conflict back in design world, whatever, saying I've got two different documents out here that are telling me information, which one is the governing document.

And we wanted to make sure that it was clear that 109, Order 109 was the governing document with NEI 13-02. So that's why we, to go along with that Greg

said, to make that there we still had, we want to know what was after before MI and started there.

But you also wanted to make sure that there was not a conflict if somebody picked this up ten years from now and saying, I've got a Generic Letter plus I've got an order, how do they relate to each other.

MR. KRUEGER: Okay, and my last slide for my portion of the presentation is the diagram on the hardened containment vent system and how we sort of went about selecting the vent design conditions for the drywell portion.

This is a simplified diagram, if you want to believe that, but it is a composite. What it is, it really is, it's a composite of information much of which came in the 1980's about the capability of containment.

We're going to back to that portion of the order that says, don't make the vent a super vent that goes well beyond the capability of containment, make sure that it's aligned with what you know.

And most of the sources of information for this diagram are NUREG CRs that looked at electrical penetrations under severe acts and conditions, drywell head leakage, Chicago Bridge & Iron study relative to pressurization of containment and where it might fail

under saturated conditions or otherwise. And this is that composite.

And what we're trying to demonstrate here is when you look at the design envelope in the lower left hand corner, many of the BWRs, this is a generalization, but many are designed at 340 degrees and about 60 psi. That's the design limits.

We do integrated leak grade tests around 62 pounds, somewhere around there. So it's pretty consistent. The design envelope is to the left.

And when we talk about what design is as compared to capability, if you look at everything that's not in red. Basically that's some measure of the capability of containment even though it was designed to that smaller square, that smaller design envelope in the left-hand corner, its capability is beyond that square.

It really can withstand and we saw it in the events in Japan that in fact the containment did withstand higher pressures. It did ultimately fail at different locations, but it did not fail at 60 pounds, it did not fail at 70 pounds. You know, there was actually capability or capacity beyond that design.

And what we do find though from Chicago bridge & Iron and these other studies is that as you

increase the temperature, so one aspect of the vent is under saturated conditions. That's why I say it's very straightforward.

Saturated conditions are in the 350 range and the containment pressure capability is up near 120. Well beyond the design capability.

So you know when you're designing a wetwell vent for just a pre-core damage, you're venting under the FLEX scenarios. You're getting a pretty tight regime, a pretty reasonable regime.

But as you increase the temperature, obviously the capacity of a equipment to withstand higher temperatures at those high pressures, degrades. And that's what this is trying to show is that at the lower temperatures the containment capability or ultimate strength is pretty high. About double of what its design is.

As you go up with temperature, now we're dealing potentially with high, dry head leakage, stretching of the bolts, degradation of the seal in the material that might be within that joint, the hatches that go in the containment. Those all start, now come into play as do the containment penetrations.

And once you get to, what I'll call fairly high temperatures, 700/800/900 degrees, the capability

of containment degrades rapidly in terms of its retention capability. We want to make sure that, one, we vent well before you ever get to those boundary conditions.

So you're going to hear about anticipatory venting which is very much in front of that to make sure that we either vent the pressure off or we allow room should there be some type of event to occur with a spike, that we still have that capability.

MEMBER BLEY: Greg, conceptionally this makes good sense.

MR. KRUEGER: Right.

MEMBER BLEY: Are the numbers on here relevant to all BWRs?

MR. KRUEGER: They're close. They're, most BWR Mark I's are at the 60 pound range.

MEMBER BLEY: Okay.

MR. KRUEGER: So Mark II's are at the 45, in terms of the design envelope. Most of the studies here were done for the Mark I's in the 80s.

MEMBER BLEY: For the, okay.

MR. KRUEGER: Yes, most.

MEMBER SKILLMAN: What is the --

MR. KRUEGER: Go ahead.

MEMBER SKILLMAN: What is the basis of the

ultimate capability? Is that a guess, is that your Y axis of 120 psig cold temperature?

MR. KRUEGER: There was actually a Chicago Bridge & Iron study done in 1987 that looked at the reference bought, basically Peach Bottom, and looked at the pressurization of containments. Looked at the head bolts, the seal material, the hatch and all of those attributes and actually did a finite element analysis that went up and showed it would fail at about 156. This is sort of bringing it back down from that saying, well where would you have confidence that you're not really stretching that capability.

MEMBER SKILLMAN: This is for both Mark I's and Mark II's?

MR. KRUEGER: Yes. It's more for Mark I's. Mark II's are a little different, but Mark I is a steel containment with a gap and then a biological shield around it. So it's designed to move a little.

There's a bellows, there are attributes of Mark I's that Mark II's don't have. Many Mark II's are steel-lined concrete containments, so they're not steel containments.

And so the way that the containment interacts or responds to pressurization is different. Is what I'll say. But in general this is meant to try

to capture all of the BWRs in a reasonable way.

MEMBER SKILLMAN: Thank you.

MEMBER BLEY: Greg, this figure isn't in the --

MR. KRUEGER: It is not.

MEMBER BLEY: -- guidance document. Is there a background or basis document perhaps that lays out the things you're going to be doing based on this?

MR. KRUEGER: We actually have discussed this both amongst the task force for developing this document as well as the filtering strategies task force.

MEMBER BLEY: Yes.

MR. KRUEGER: Because this plays into that as well.

MEMBER BLEY: Sure.

MR. KRUEGER: And one thought is, well it will be in the next tier document down so that people can visualize and see --

MEMBER BLEY: So you were thinking about touching --

MR. KRUEGER: Yes, yes.

MEMBER BLEY: Okay.

MR. KRUEGER: Again, people get very specific about very specific points and that's not it. This is just to show capability. And we drew this

square, this proposed design for the drywell vent because it's a reasonable design point well beyond the design envelope in terms of temperature and a little bit higher in pressure.

It happens to correspond for the BWRs when the calculations are done for the EPGs, for the emergency procedure guidelines for the primary containment pressure limit. Many calculations end up with this temperature right around 545.

So that's sort of why it was selected. Could it be a little different then that, it could be. But it was just to put some bounds on this envelope such that we could design to that or build or order components to that point, knowing that the capability, again, is a little further to the right and a little further up in pressure.

MR. BUNT: I think that goes to Mr. Skillman's question earlier about, do we have the capability from the engineering manufacturing phase to do something and that's why we were looking at providing a design value instead of a capability value but that's what engineers, designers and manufacture to build to.

MR. KRUEGER: Any other questions on this diagram? If not, I'll turn it over to Mr. Parker.

MR. PARKER: Again, my name is Tom Parker

and I'll talk a little bit about the procedure that's going to allow operators to open the vents. Basically how, when implied we want to open the vent and get the search points in the procedures.

I think before Fukushima I had appreciation for the vent that's a little different then I do today. I looked at it as an item to make sure that we didn't over pressurized the containment.

And what I've learned since then is that the vent is a excellent heat removal term and provides a lot of other features in coordination with RCIC extending it's length of operation.

Of course if RCIC is drawing off the suppression pool and the suppression pool is being heated up by the decay heat, then RCIC uses that same water to cool the bearings for RCIC. And if that temperature gets to high, then the RCIC pump can fail.

So that's one, how that ties into venting is venting can move the energy from the suppression pool keeping the temperature of the suppression lower, extending the life of RCIC.

The heat removal during this event is rather limited. Our normal heat removal, if we had a local for example, would be to use the RHR pumps, as we talked a little bit about earlier, and the coordination with

the RHR service water pumps to remove the decay heat from the suppression pool.

In this case, the decay heat removal system is not removable because we don't have power to operate it. So that's one tie-in with the question on the containment accident, pressure with respect to the fact that these pumps aren't going to have any energy to operate. So under these conditions venting would be a, would be permitted.

Not only do we cool the torus but we're cooling the containment and we're keeping the containment function reliable. Ultimately we want to make sure that the containment doesn't fail.

Certainly we can see some examples where containment failure happened in Japan and certainly that's a very, we want to learn lessons from that event.

Another advantage that the vent has is it's fairly simple. We don't have to roll out any equipment or provide new equipment.

We may modify the vent certainly associated with the order to make it more reliable. However right now the Mark I's have hardened vents.

They require DC power to operate a solenoid, in most cases, and then compressed gas. Either air or nitrogen to hold the valves open during venting.

The operators are trained on the use of this equipment right now. We have that in our emergency operating procedures.

We're proposing to make a small change to those to improve those procedures for this event. But right now the operators are trained on this equipment, they know how to use the equipment and minimal support systems. Did you have a question?

MEMBER SKILLMAN: I did. On your first bullet, I don't understand the addition of the, F-L-E-X, the FLEX on that bullet. It seems to me the FLEX is after 24 hours, this anticipatory venting is probably in the first 24 hours?

MR. PARKER: That would be correct.

MEMBER SKILLMAN: So I don't understand what FLEX has to do with this discussion?

MR. PARKER: We would use the, the FLEX procedure has, or the process, has three phases. And the first phase would be to use the plant install equipments, so maybe zero to eight hours.

Phase 2 would then take us out probably beyond 24 hours somewhat. And then Phase 3, you're correct, is after 24 hours. So the FLEX, Phase 1 and for Phase 2 would be the most likely spot where we would be using the vent, opening the vent. So that's why we

added the term FLEX in there.

MR. KRAFT: Well FLEX applies, not just to the offsite resources, right? It applies to, as Tom just said, the first phase is installed equipment, second phase is onsite portable equipment.

MR. PARKER: Right.

MR. KRAFT: And then the offsite equipment. So the, learning from Fukushima it's not clear when you're going to have to, on any given scenario, vent to maintain RCIC operation, right?

I mean on Unit 1 at Fukushima they could have, well that was isolation plant and it was on off and they didn't know it was off. That's another matter.

But the point being that when one plant RCIC ran pretty close to 70 hours. Another plant RCIC cut out after it was like 40 hours and another 16 hours of low pressure injection. Or the other way around, I forget which one.

So you want to vent on time. And it's during that entire period of time you might have to vent.

This goes to exactly the point that we were talking about with the staff is, when do you imagine opening up that vent. And you'll show them on the next slide the procedural change that has the vent opening under ELAP conditions earlier then you would have ever

imagined.

MEMBER SKILLMAN: My point is that they have FLEX identified in that first bullet, seems to be out of place. Because for your anticipatory venting, you're venting, I would think, within the first 16 or 20 hours. And FLEX is certainly beyond that.

MR. KRAFT: No, that is not true. FLEX starts the moment you lose you ELAP, have an ELAP. FLEX does not kick in 16 hours later.

CHAIR SCHULTZ: You're talking about the onsite capabilities, correct?

MR. KRAFT: Yes, onsite capabilities, installment capabilities.

CHAIR SCHULTZ: FLEX component, nearly FLEX component.

MR. KRAFT: Right.

MR. BUNT: Much of the strategy to maintain core integrity so that you don't get core damage, starting at the point of ELAP until the point of, that all site services get restored to a point, so that's when you have the three phases.

MR. KRAFT: Okay.

MR. BUNT: So when you talk about mitigation strategies and FLEX, we're talking about that whole gambit of things that say, from a time that an

external event occurred until we get to the point that we're in a favorable point at the end of it. At the end of where Phase 3 would be and we start going into recovery.

So that's the whole gambit of where FLEX is. And then for anticipatory venting, in order to not get core damage, if we say that is a element of FLEX, that's one of the tools that's utilized to mitigate the consequences through getting core protection, to get enough adequate core coolant.

So FLEX is the response ELAP. If you go back to our first slide, that's what we meant by the vent has to function in multiple modes.

And one of the modes that a vent would be functioning in would be in a FLEX ELAP type response to mitigate core damage. And that would be the preferred way to respond to a hazard versus it progressing to a severe accident event.

MR. KRAFT: Now having said that, all true, I think something that Phil and I have talked about a lot is that the event starts and you don't know it's going to be an ELAP. You don't know that that black swan is coming.

So how do operators know what action do I take, when do I start stripping loads, when do I start

thinking about opening up the vent? That's where the in depth knowledge of how the machine works. It's so important to know that. Phil, you want to --

MR. AMWAY: Yes, this is Phil Amway again. When we have, the station blackout is pretty self evident in terms of the control room. You can see the annunciation, the loss of power.

The question then becomes, okay, well how long does that station healthy, right. And so in that additional event response that we're going to do in addition to stabilizing reactor parameters, we're going to be sending people out and making calls to the electrical dispatcher to say, you know, we've had a loss of power and from your end, what do you see as progression as far as when it's coming back to the plant.

We already have agreements in place that say, you know on a priority basis, you need to restore a nuclear plant early as opposed to other locations. But then at the same time, I need to send people down to my diesel generators to figure out, A, why they didn't start and is there a fast recovery path.

And then look at the switch yard too. I mean is the switch yard essentially attacked or has some major event occurred that created significant damage to the switch yard.

And from within that in that first hour, I am going to be making that determination of whether this is a station blackout, that's within the current four hour framework of the station blackout, or is it something greater that's going to push me into the extended loss of AC power capability.

So initially my actions are going to be insane and then at some point as they gather more intelligence as far as how long that loss of power condition is going to last, we try to be into looking at this anticipatory venting as a strategy for long term.

MEMBER SKILLMAN: I made my comment because I viewed FLEX as those actions to hookup equipment that is already not hooked up.

MR. PARKER: That would be --

MEMBER SKILLMAN: Okay, and so, having been through one of these big accidents, I will tell you there is time compression for an accident. And the 16 or 20 hours could be gone like that.

MEMBER BLEY: Absolutely.

MEMBER SKILLMAN: And if you're going to be in the moment dealing with the accident saying, hey guys, go out there an hook up all that gear, you will only achieve that if you practice that over and over again. And if it's not practiced, you will not have

that FLEX gear hooked up and you are going to be venting without FLEX.

MALE PARTICIPANT: Undoubtedly.

MEMBER SKILLMAN: That's my point.

MR. PARKER: And our key, at least as we go through it, still we're trying to understand how to do this. We want to make sure and give the operators as much time as possible because you're exactly right, although it's not necessarily a short time event, there's still a huge number of things to decide and that's why the procedures are going to be very important for the operator in those conditions.

MEMBER SKILLMAN: And I agree with this gentlemen. You're in the moment, you're asking yourself, is this going to be a short-term loss of offsite, long-term extended loss of AC.

And those are unknowns as the event progresses because you don't know what you don't know. You're in the moment and it's overtaking you.

And figure you'd have a damage assessment and other information, you may or may not know when's the time to start hooking up your FLEX equipment.

MR. PARKER: Most of us are using one hour as kind of a landmark event to decide, are you going to get power, are you assured you're going to get power

back quickly or not. And if you're not assured that you're going to get it back very quickly, then you need to get into setting up your portable equipment --

MEMBER SKILLMAN: Yes.

MR. PARKER: -- as well as making sure because you can't wait for four hours to make that decision. You need to make it right away.

MEMBER SKILLMAN: Okay.

MR. AMWAY: To answer that question a little bit though, that FLEX, the term FLEX, includes that installed piece of equipment that I have which is my reactor core isolation cooling system. And so whether it's long-term, short-term SBO, station blackout, that RCIC pulse is what I'm going to use.

And now as I learn more about the accident and how long it's going to be, then it's the anticipatory venting which will also be installed equipment that I don't have to connect and hook up to, is also available to me to prolong the use of that reactor core isolation cooling system.

So it's all a part of FLEX, it's just installed equipment versus having to actually go out and hook something up to connect it.

MR. BUNT: I think it's the disconnect in, when you, most people talk about FLEX, the preponderance

of information that's provided as that Phase 2 type of FLEX.

MEMBER SKILLMAN: Yes.

MR. BUNT: Or the Phase 3 which is the region response. And the Phase 1 is covered a lot with procedures and enhancements to existing site functions.

And I can understand where FLEX, when you think about, you're thinking about the extra equipment as opposed to the installed equipment.

MEMBER SKILLMAN: Yes.

MR. BUNT: Again, that's why we were saying that this is, when we listed here is that global FLEX strategy that's Phase 1, Phase 2 and Phase 3. Not just the Regional Response Center items that are out there with the longer duration or even the plant portable equipment, which is the Phase 2, and that's what we meant by FLEX.

MEMBER SKILLMAN: Thank you. That's very helpful, thank you.

MR. PARKER: Just to reiterate what Phil said, that's really important here, the question about the timing too, because the earlier the venting the cooler we can keep the torus, the longer we can operate with RCIC before we do have to count on other systems.

MEMBER BLEY: I would like to make a

comment. Any those of you who have extensive operating experience you guys maybe you'll agree with me or not but I think you will. You got an hour to decide.

I don't know of a case, where we had a major problem, where within an hour somebody said, we're dead, we're not going to solve that I need ten more minutes, I almost got this baby, give me a little more time. It wasn't until you tore some lines apart and found rags inside the oil lines on the diesel or something and you said, oh god, I give up.

But it's going to be a hard decision to make because you're always going to be getting reports from the field. I can get this report.

MR. PARKER: You bet you. I mean that's the way operators think, you know, I can make this work --

MEMBER BLEY: Yes.

MR. PARKER: -- and I can fix this. I'll get it for you.

MR. KRAFT: Yes, again --

MEMBER BLEY: Makes the four hours pretty quick.

MR. PARKER: And that's why we want to have a hard line at one hour, I can say you don't jet for four hours, if you think about this. After one hour,

if you're not sure you're going to get it back you've got to get into the actions for setting up the portable.

MR. KRAFT: Again, the learning from Daini, once the event happened and they had one incoming line available but the voltage was fluctuating all over the place, we saw the other plants both fossil and nuclear had been lost off the grid.

And the site superintendent began sending people out to make calls on different parts of the plant wondering whether he was going to see them again, I might add, and eventually determined, made calls to the dispatcher about sure up that line.

And when the tsunami, the tsunami wiped out their sea water pumps. So they went down, the group went down to the sea water, the exchange building and this is exactly what would happen.

The maintenance guy said, boss we'll tear it down and rebuild it in an hour and he said, nothing doing, find another one and they started laying nine kilometers of cable. Cable sections that you couldn't pick up in 30 hours in the dark.

I mean like dark. And the cable, we saw it, it ran back all the way behind panels and they were within two hours of melting the core.

MEMBER BLEY: But, you know, can a guy make

that decision --

MR. KRAFT: Exactly right.

MEMBER BLEY: -- at the time.

MR. KRAFT: Exactly my point.

MEMBER BLEY: It's hard --

MR. KRAFT: Exactly right. That was the main discussion we had with the CNOs is the leadership, on-shift leadership. Because what Phil will tell you, because Phil was also a certified emergency director, is that when that hits, you're shift superintendent is your emergency director. No one else, you haven't shown up yet.

MR. AMWAY: Right.

MR. KRAFT: You're not there for an hour, right?

MEMBER SKILLMAN: If we can get there.

MR. KRAFT: Exactly.

MEMBER SKILLMAN: If we can get there.

MR. KRAFT: Precisely right. And that's exactly what we're trying to do now with the procedures, with the, we're going to talk about better kind of training.

I think you're exactly right, Steve, it all filters in on this one and we're going to see things develop as a result. So --

MEMBER BLEY: Let me just say, I really wish INPO were in with you guys on this from the beginning. You know, this stuff you said is obviously true.

When we started in the Navy nuclear program we knew you had to have an integrated knowledge and really understand the statement. When we started in commercial plants we did and then by the time of TMI we kind of forgot it.

After TMI we knew it again. Now we're saying what we really got to get that guy who really fully understands this place. How do we stay there and I think the INPO guys are the ones who might help us --

MR. KRAFT: And I think you're exactly right about that. And I recall in one of our many quiet moments saying to any number of CNOs, what would have happened if Masatu-san had been in Italy on vacation with his family?

MEMBER ARMIJO: It would have been different.

MEMBER BLEY: Yes.

MEMBER ARMIJO: I met with him a year after the accident.

MEMBER BLEY: It was about a year ago.

MEMBER ARMIJO: Very impressive

individual. Obvious leader and, in addition to his knowledge of the plant, he inspired his people who were worried about their families. There was a Tsunami. People forget that.

They're worried about their families, they stayed put and they saved the plant. So, you know, I think that --

MEMBER BLEY: But you don't make a guide like that --

MEMBER ARMIJO: You can't --

MEMBER BLEY: The guidance documents and proceedings.

MEMBER ARMIJO: Exactly. Exactly. And so I think that's a tough problem to solve. How do you get people like that? How do you keep people like that? And make sure there's just one.

MR. PARKER: And I think we need to improve the procedures to make that work.

MEMBER ARMIJO: Yes, your procedures will --

MR. PARKER: Keep in the rule base, and not into what they're trying to develop what the procedure steps should be. So I hope that is one of the things that we're going to get out of this event.

MEMBER ARMIJO: My guess, if he had had FLEX

equipment, like we're thinking now, his job would have been a whole lot easier. He wouldn't have had helicopters flying stuff in from Tokyo, or other plants. Or dragging nine kilometers of cable. But I think more emphasis should be placed on that issue of training and leadership.

MR. PARKER: Absolutely, yes.

MR. BUNT: And I think when you look at the FLEX strategy, and some of the activities that are done there, there are two committees that are INPO driven committees. One of them training, development. And one on emergency response coordination, that are working that. And they're working with the FLEX structure.

And anticipatory venting is probably mentioned in the first bullet here, is that is all part of that piece of it. And the area that we're talking about here to get more INPO involvement, when we talk about into the severe accident range, that is an area that we can go back and further investigate.

But for a lot of the modes of the venting, and the FLEX piece of it, there is already an INPO integration of that. And there is some standard planning, some standard structure that's going into that. And there are two taskings that are working on that.

MEMBER BLEY: Okay. We heard from them early on but I haven't heard anything from them in a long time.

MR. KRAFT: Again, this is one of these areas where there's a nexus to a lot of things. I will speak with the Fukushima Steering Committee leadership and say, you know what, we need to schedule some time back with the ACRS to talk about these other, call them the software side of the equation, and I'll make a commitment to do that.

MALE PARTICIPANT: Thank you, Steve.

MR. KRAFT: All right.

MEMBER SKILLMAN: I'd like to make a point that we made when we were up with the people at Peach Bottom here back in July. One of the questions that we had, Greg had --

MR. KRUEGER: Yes, I was there.

MEMBER SKILLMAN: Okay, you heard the question and that is how do you know where the transition occurs? You're moving out of EOPs, you're going into your SAMGs and how do the decision makers know when they've gone past this for the decisions that need to be made?

MR. AMWAY: Would you like me to answer that question?

MALE PARTICIPANT: Go ahead because you --

MEMBER SKILLMAN: Sure, yes, please.

MALE PARTICIPANT: You need to state your name, please.

MR. AMWAY: Oh, Phil Amway. The transition out of the EPGs, which is related to the plan of the emergency operating procedures to the severe accident management guidelines, has very specific points within the EOPs that say if you meet these conditions exit all EOPs and enter the SAMGs.

Once you've made that decision, you're not trying to coordinate between two sets of procedures. You are fully out of the emergency operating procedures. You are fully in to the severe accident management guidelines.

Now some of the strategies, the equipment you use, are going to be the same. However, you're not trying to be in both at the same time. You're either in the EOPs, you stay there, you exit, you get into the SAMGs and you're in there executing those strategies, so it's very clear. The guidance is clear there now and it would remain so in the rev 3.

MEMBER SKILLMAN: Okay, now, what you've done is you explained the paper trail. That's good. What we were concerned about is the intellectual trail

of management.

Who says with a procedure changing from the EOPs to the SAMGs the leadership is now with either the shift supervisor, the shift foreman, the plant manager? It's moved to the superintendent of all nuclear plants. How is it clear that the decision-making authority, the individuals, are where they are supposed to be when you get to this point?

MR. AMWAY: Okay, and I'm going to answer how it works in my plant and I've got some other colleagues here that can answer the question for their plant if it differs.

But as the emergency operating procedure director, which is an SRO, licensed SRO, they'll be running the emergency operating procedures. When they get to that point where they are exiting the EOPs, entering the SAMGs, he is still directing that initially, okay.

And I'll say the way it's supposed to work, and we understand under severe conditions you may not make it in the hour, but once you engage the emergency response organization, that they're supposed to be able to staff the facilities within 60 minutes.

Whatever that time occurs, whether it's 60 minutes, which is the normal design, or somewhat longer

in an extreme event, the control room staff is still maintaining control of the actions from that point in the SAMGs doing the execution. That's always a formal turnover between the in control room staff executing the procedures and the transition to the technical support center, okay?

Now, this is where I'm going to my specific facility. We have the SAMGs in our control room. Now, we put them up on the table. We put them over top of the EOPs. We mark them up. We follow our paths through and we execute.

Now, the technical support center, once they staff up, they get their turnover, they understand where they're at, they are then going to help us and make recommendations as far as based on where you're at in the accident these are the strategies and the priorities we think you need to execute.

And then we will then, as operators, execute those actions, provided, you know, we're in communication discussing it, getting that alignment and agreement.

So the way I see it is it's not so much that I'm transitioning to the TSC and I'm just waiting for them to tell me what to do. It's more of a collaborative effort.

It's an extension of my technical capability and understanding to have that outside expertise in the TSC which has a lot of, you know, operations/engineering type folks that can help me in that decision making process and how I'm executing my SAMGs.

MEMBER ARMIJO: Like you make the decision?

MR. AMWAY: Yes.

MEMBER BLEY: That's good. I wish we heard the same thing from everybody we talk to. We don't.

MEMBER REMPE: What if you disagree?

(Simultaneous speaking.)

MEMBER REMPE: Everybody recognizes that and --

MR. AMWAY: Yes.

MR. FALLON: Well, I come from a plant that has a slightly different structure. So Pat Fallon once again, SRO at Fermi and I'm also a qualified technical engineer down in the ERO organization.

So where Phil is, we would be in the exact same spot if our TSC was not manned. All the operators are trained on both the EPGs and the SAGs so they all understand the flow charts and we all practice them probably as much as the ERO does, okay, so everyone has an idea of what they need to do next.

If there's nobody down there to call and get relief, it's still yours. You're an operator. You live with it. You know, you have to do what you have to do for that plant.

If there is a staff TSC, we actually have a turnover checklist between the technical engineer and the control room so that he gets all the information they've got on where you are in terms of the status on the flow chart, what equipment's operating, everything, so we go through all of that.

The tech engineer down in the TSC for us has basically a core team of folks that he uses, a thermal hydraulics engineer whose sole mission is to look for degrading core geometry, indications of fuel failure, indications of the next step toward real RPV breaches, looking for RPV breach. That's his main function.

There's an INC engineer to look at all of the instrumentation that you're seeing, to make sure that you're getting proper indications of things. He has alternates identified as to what he should use, okay, including core thermal couples, pressure indicators, temperature indicators, all that, okay?

That team meets with the tech engineer and the emergency directors in the TSC and they will formulate a here's how we're going to proceed on the

SAG charts and they will consult also with the controlling staff.

They'll also bring into that the expertise that Phil talked about, having the engineers that says right now I can't get 400 gallons a minute. I need to get another system going.

And they're probably going to be doing things that are beyond what the procedures say to get that other pump going, to get that other injection source going, okay?

Bring back power, whatever they need to do, and then use the whole staff of the TSC to do that and stay in communication with the control room because they're going to have to execute the plan.

So it's a little bit different. Some plants, they shift that decision-making and formulation of the plan and where you're going on the SAG charts down to the TSC. Other places they leave it up in the control room.

Both cases I believe, though, it's a cooperative effort between the engineers and the operators to get it going.

MR. AMWAY: And I agree with what Pat's saying. I mean, it's cooperative so whether really retained in the control room or in the TSC, I don't know

of anybody that would be in the TSC that's going to say, no, you have to do it this way if a licensed operator is telling them this is why you can't do it that way and this is the alternate course of action, so.

MR. FALLON: One other item. All of our tech engineers are former shift managers or SROs, so it's really an SRO to an SRO. He's just directing other resources that aren't available.

MEMBER SKILLMAN: Okay, thank you. Thank you.

MR. PARKER: Back to the slide. Also the one advantage to the venting is using the latent heat of vaporization, of course, which is a very efficient heat removal transfer.

We obviously are using installed equipment, the RCIC equipment. We don't need to roll it out. It's all installed and ready to use. There's a lot of talk about procedures, so let's go to the next slide.

This is talking about some changes that we'll make in the EOPs, not the SAMGs, but the EOPs and that's where the operator would make the decision of opening the containment vent or not.

This is a new criteria that we've added. It's actually an override that is going to jump through some of the steps that Phil was talking about and going

through the pressure leg on the flow chart.

And this override would allow the operator to jump around those steps, many of which we would not have power to perform anyway and if containment pressure's greater than the scram setpoint for containment pressure, which is around 2 psig in most plants, and, this is an important and here, and it's required for core cooling.

So if we have RHR pumps running, we don't need to use the vent for containment cooling and, therefore, we could not open the vent in a case where we're using the RHR pumps and preserving the cap also.

So since we don't have RHR pumps, we are going to require the vent to cool the core. That is, at this point, our primary decay heat removal or mechanism from the containment and certainly opening the vent also will lower off-site doses in the future if we can protect the containment.

First of all, if we can keep the core cool, keep RCIC running, keep water on the core, vent the containment, we should get in the situation where we don't have any fuel failure.

And certainly if we have fuel failure, there's a potential for the containment to fail also, so we believe that what we're doing here by venting is

preserving the ability to isolate the containment and the containment function.

Another feature, as we noted in the footnote on this slide, is venting also lowers the suppression pool pressure and allows us to depressurize a reactor further with the SRVs. That allows us to use portable pumps if we need to, if RCIC fails or when RCIC, we choose not to use RCIC anymore.

So that's what I have to say on venting and we've had a lot of discussion and good questions on that. If there aren't other questions, I'll turn that over --

MEMBER BLEY: Well, I'm just sitting here toying with, this is a fairly clear operational decision point. Well, the first one's very clear. The second one I don't know how clear it is to the operators until you get the guy who really has the integrated knowledge of the plant.

The chart that Greg showed us earlier has this on temperature pressure criterion which aren't quite like this and I wonder how those things get integrated or if that's still work to come.

MR. PARKER: Well I guess maybe, Phil, you could help us here. Do you feel this is a clear decision whether you have core cooling or not or, you know, I'm

thinking if you don't have RHR you don't have containment cooling.

MR. AMWAY: Yes, that's right but to back it up a little bit, you know, what you actually see in the override has each of the steps in the EOPs including overrides have bases documentation that's developed and supporting of those steps. So, I mean, the idea is you're trying to fit this whole procedure on a flow chart. Obviously you can't put all this --

MEMBER BLEY: Is this actually implemented now somewhere?

MR. AMWAY: No. It's not.

MEMBER BLEY: For anybody, for any plant?

MR. AMWAY: Where it is right now is the BWROG has approved it as EOP/SAG rev 3. Now it's up to each individual plant --

MEMBER BLEY: To apply it.

MR. AMWAY: -- to take that generic and apply it to plants specific.

MEMBER BLEY: And build that kind of second-level documentation across there.

MR. AMWAY: That's right. So now that second-level documentation, my bases documentation that supports this revision, could help me define what that really means.

MEMBER BLEY: Okay. Well, I can see getting there. The level offsite dose is what I was saying. Not many guys would know exactly what would get them that and maybe a lot of us don't know until you really do some careful analysis. That's going to pay off and it really depends on knowing exactly where you are, would even have a shot at it.

MR. FALLON: Pat Fallon once again. Follow up on Phil's comment. The bases documents right now let us know, like, if we're going to use an override, I'll use kind of a for example, but the ATWS override that says I can't get all of the rods in.

I go to a different chart. This one, it'd be an override and I've seen the one that's going into our plant. It says I don't have any power to do any of my containment pressure control methods, right?

Then I would have to vent if I want to control containment pressure so that I could keep the torus temperature low, right, and basically prevent that core from being damaged.

So those two right away, in the bases document, it would describe that what I'm doing is trying to prevent core damage so I don't have to worry so much about the containment function while I'm using it to remove decayed matter.

MEMBER BLEY: And it sounds like you're actually close to having at least a draft.

MR. FALLON: We have a draft of the chart but we haven't finished all of our bases documents and as an operator and former operator you know that bases questions on the EOPs are absolutely the favorite target of training so everybody's going to know those.

CHAIR SCHULTZ: So that's the part of getting to the point of taking the action to open the vent and --

MR. FALLON: And understanding is key.

CHAIR SCHULTZ: -- in the particular case that we've described.

MR. FALLON: Right.

CHAIR SCHULTZ: What Tom had, you had also said and, Greg, you talked about it before, I know Jeff has it in his mind, and that is opening and closing the vent. And so what guidance is in the process associated with determining the closing part of that equation, of that process, closing the vent?

MR. GABOR: This is Jeff.

CHAIR SCHULTZ: What are you looking for next?

MR. GABOR: I'll take a cut at it. Yes, obviously as Tom pointed out, this venting action is

being taken prior to core damage. So this is a clean, what I would classify as a clean vent situation.

The way that the guidance is put together is if the conditions that put you into that override no longer exist, then you don't take those actions. You don't follow through with that action.

So if this event would progress to core damage -- let's say RCIC was lost at, you know, 72 hours Steve said at Unit 2 Fukushima, 60 some hours. So if RCIC was lost, you no longer have that condition that put you into that venting situation.

The other thing that you would see is if you did get into the conditions, as Phil pointed out, that take you to core damage or take you to the point where you transfer over to the severe accident guidelines, it's very clear there what your set of priorities are and when you would vent.

And, again, the operators would not be seeing, the signals would not be seeing the guidance that would tell them to keep that vent open and they would close it.

MR. AMWAY: Just to expand upon that just a little bit. So once I get in this override and I've made the decision I need to open the vent bad because I'm trying to preserve adequate core cooling RCIC

operation, so there's two things that could get me out of that.

One is power comes back. Now I have alternate means for removing decay heat so now that override does not apply anymore and I re-close the vent and go back to my normal steps and sequence, removing decay heat from the containment.

The other one being is if I'm trying to use this reserve RCIC and for some reason RCIC fails, for whatever reason it fails and that was my only injection capability, now that override only covers that series of steps which would normally envelope by normal means of removing heat, which is containment sprays. They weren't available.

Now I use this vent path and it only goes down to the point of maintaining adequate core cooling.

One of the things that's going to drop me out of the EOPs and into the SAMGs is I lose adequate core cooling so RCIC fails, level drops, I no longer have adequate core cooling. Now I'm below that override. I'm dropping out of the EOPs into the SAMGs.

When I make that entry into the SAMGs, I have to re-evaluate. So if my vent's open going in, I need to close that vent path off and now I'm into the SAMGs strategies for execution.

MR. FALLON: Pat Fallon once again and following up on Phil's. Basically when you're in the EOPs or the SAMGs you're in multiple legs. So the leg Phil's describing is the pressure control leg for the containment.

I'm also in the reactor control leg for water level. So if I'm running RCIC, I got a system that's doing his function. If I lose RCIC, that leg will give me further instructions on what to do, one of which would be probably to depressurize so I get my low pressure injection systems going and stay in EOPs. I wouldn't have to actually drive myself to the SAGs, okay?

So we're in multiple legs. We do everything that they'd like to instruct us to do so you might have different guidance in a different leg on what to do with containment pressure to allow you to inject.

MR. GABOR: Guess I'll add one thing. Having said that, and it's a good segue into the rule making, because what the impact of that action of not closing it could affect our filtering strategies, our mitigation strategies after the cores become damaged, where FLEX is dealing with preventing core damage, and we've shared this multiple occasions with the staff.

When we view the types of scenarios that

we have to deal with for filtering strategies, we have to consider the one you're talking about, the case where the anticipatory vent was used early but there was a failure to re-close it and to see what impact that has on our filtration strategies. So it's a good question to ask. We have to deal with it on the rulemaking.

MR. BUNT: My point was if there's an assessment that's made as you transition or are you in one of the legs going to the other leg in that assessment evaluation of plant conditions going forward and that assessment would drive you to certain conditions and certain actions going forward.

MR. PARKER: So to summarize what we're doing here with the new procedure change is we're lowering the setpoint where we would open the vent to above the scram setpoint.

Certainly you're not going to open it at two pounds. It's just not enough dp to drive much out the vent at that point, but that's going to give the operator some flexibility to determine when to open the vent.

Certainly the other option or the other advantage of venting we talked about was lowering pressure and such that if RCIC is lost we will have at that time the portable pump stage.

If we didn't, Phil was explaining what would happen, but certainly our normal expectation here is that we would be in Phase 2. We'd roll out our portable equipment, hook it up, lower the reactor pressure and be able to keep the core cooled with the portable equipment.

So if there aren't any other questions, I'll turn this over to Jeff to talk about rulemaking.

MR. GABOR: We have one slide. I got one slide. That's all they've given me.

CHAIR SCHULTZ: This is a surprise.

(Laughter)

MR. GABOR: No, what we wanted to do is just to kind of give you a window into where we're at on rulemaking activities.

We've had a large number of good technical exchanges with the NRC staff on this and we've got another full day planned tomorrow to get into a lot more of the details of where we're going with basically developing the technical basis for the rulemaking.

The rulemaking is going to assume that this severe accident event, EA-13-109 mod, has been done and is in place, so all this discussion up till now that you've heard provides the basis for what we're going to assume in terms of the plant design.

In addition to that, as you just heard from Tom, there's a lot of post-Fukushima lessons learned, this anticipatory venting issue, some other things that we also will assume and use that to drive our technical bases development as we go on.

A big part of that technical bases development is, and we were told by the SRM to look at the dominant scenarios. So we've put a lot of effort into creating we call it a core damage event tree to take all of this information that you've heard in terms of the operator actions, the expected operator actions, to create some credible scenarios that we really need to focus our filtering strategy investigation on. Like I say, we're going to have another meeting with the staff tomorrow to get into that even further.

Once we have identified kind of the dominant scenarios that get us to core damage, we now have developed a, NRC calls it the APET, the accident progression event tree or containment event tree, where we now take those core damage scenarios and progress all the way through to potential release to the public.

And that's where we'll be able to investigate several alternatives. With the support of the staff, we've identified kind of a priority list on what are the strategies that we really want to focus

some attention on.

We have FLEX equipment in the plant, not designed necessarily for severe accident mitigation, designed to prevent core damage with potentially some I'll say minor modifications, no such thing as a minor modification to a nuclear plant, but with some modifications the use of that system in a severe accident environment could be achieved.

So we're going to look at things like being able to use that pump as an RPV, injection into an RPV, whether that RPV has failed and fuel's melted out on the floor or not. Obviously if that mitigation could be achieved early enough, you could potentially keep the core in the RPV.

We also are looking at strategies to utilize, again, that pump or a pump like that to put water inside the drywell. Might not have to be up all the way into the drywell spray headers but just to get water coverage on the floor.

Obviously if the vessels fail and I put it in the vessel, it's going to end up on the floor as well but this would be a separate investigation to look at modifications or alternatives that would give water to the floor of the containment.

A couple others that I'll mention would be

the installation of what we classify as a small filter, external engineered filter. By small we don't mean a low DF or a low decontamination. We mean lower capacity.

Probably a small filter wouldn't handle the same heat load that a larger filter would handle. Smaller filter wouldn't be able to sustain the aerosol loading that a larger filter could do.

So we're going to analyze the value, the benefit of a small filter and also a larger more, I'll call it traditional like the ones that are installed perhaps in your.

So the industry's created their containment event tree, the core damage event tree. We've got a pretty good handle on what the scenarios are really going to drive the release and now we can begin to analyze our alternatives to look at the benefits of them.

And then last thing I guess I'd just mention is early on in our discussions with the NRC staff we obviously looked at the SRM and we looked at what kind of performance goal are we really after here? You know, how good is good enough? What's our target?

We identified, and the SRM obviously does this as well, and we looked at what the SRM said. I think in a lot of cases we offered some, I'll call them

perhaps some minor modifications to the goals and the objectives.

And then clearly the performance measures. I mean, how are we going to know, like I said, that it's good enough, that our filtering strategy is successful?

And one of the things we did look at is, much like the recent spent fuel pool evaluation that the NRC did, we looked at the margin to the quantitative health objectives.

Obviously the plants as they currently exist meet the QHO, but we looked at how can a filtering strategy extend that margin to the QHO even further?

For example, we looked at the SORCA results and we plotted the various scenarios from SORCA which basically gave us a release and a individual linked cancer fatality risk and we compared that with the QHO.

We can look at the cases that were run in the EPRI study and also in SECY-12-0157 and we can put those up against the QHO and we can see, okay, for an overall decontamination factor in containment of 1,000 what kind of a margin to the QHO does that give us?

Some of the things that we found is that for DFs even as low as, say, 100 or so we still had maybe several orders of magnitude margin to the QHO.

What we're trying not to do is to draw a line in the sand on a decontamination factor. So we've offered and had good discussion with the staff on various ways that we can determine if a given filtering strategy is really beneficial.

Obviously the industry is also looking at the cost-benefit part of that equation as well, so we're kind of approaching this from a lot of different angles to help us prioritize what kind of filtering strategy really makes sense and has the, you know, most bang for the buck for us.

So that's really all I wanted to lay out. Like I say, we've had many meetings. We've got another key meeting tomorrow and I'm sure we'll be back here talking to you as we get further and further into the rule making.

MR. KRAFT: So that, Mr. Chairman, concludes our prepared comments by the Committee.

CHAIR SCHULTZ: I'd just like to say, Jeff, with regard to that last note, that I'm glad to hear that discussions are still keeping many options open as you go forward and work through the analysis and the discussions about possible solutions and you're refining all of that but, again, you're not closing options that could be beneficial.

MR. GABOR: We're not.

CHAIR SCHULTZ: Any other comments or discussions, questions? All right, with that, I would like to call a recess to the meeting and come back with the staff's presentation. I will call the meeting back to order at 3:15.

(Whereupon, the foregoing matter went off the record at 2:55 p.m. and went back on the record at 3:12 p.m.)

CHAIR SCHULTZ: I'd like to call the meeting back into session. We now have the opportunity for this presentation and discussion with the staff, and I'd like to call on Raj Auluck to open that presentation.

MR. AULUCK: Thank you, Steve. Good afternoon. I'm Raj Auluck. I'm an NRC project manager in the Japan Lessons Learned Project Directorate within the Office of Nuclear Reactor Regulation. With me today are the lead technical staff members from NRR, Mr. Nageswara Karipineni and Jerome Bettle, who will be presenting the bulk of the presentation. Other staff members who participated in preparing this Draft Interim Staff Guidance are also present in the audience and are prepared to answer any questions you may have.

I'll briefly go over the meeting agenda and

overview and the schedule. This is the order of the presentation. As you may recall, Commission SECY-12-0157 was issued in November 2012. It incorporated comment from the public stakeholders and the ACRS. SECY provided options to address questions about maintaining containment integrity and limiting the release of radioactive materials if venting systems were used during severe accident conditions.

The Staff Requirements Memoranda on this SECY was issued on March 19th, 2013. In it, the Commission directed the staff to take certain actions, and these are noted on this slide. It required licensees to upgrade or replace the reliable hardened vents required by Order EA-12-050 with a containment venting system designed and installed to remain functional during severe accident conditions. It directed the staff to develop a technical basis for filtering strategies with drywell filtration and severe accident management of containments. It directed staff to develop and propose their final rules. And, separately, it directed the staff to seek Commission guidance on the use of qualitative factors in regulatory decisions.

As directed in the SRM, the staff engaged external stakeholders throughout the development

process. There were five public meetings held between issuance of the Staff Requirements Memoranda in March and mid May when the draft was completed.

The revised order EA-13-109 was issued on June 6th, 2013. It included a two-phase approach to ensure implementation of adequate protection and cost-justified enhancement with minimal delays. This order superseded Order EA-12-050. Since the requirements of EA-12-050 were also reflected in the revised order, the licensees were no longer expected to comply with the requirements of EA-050.

I'll just go over briefly the scope of the two phases. Phase 1 involves upgrading the venting capability from the containment wetwell to provide elaborate severe accident-capable hardened vents to assist in preventing core damage and, if necessary, to provide capability during severe accident conditions. As noted on this slide, the revised order added severe accident capability.

And this is a time line of implementation of Phase 1. It includes submission of the integrated plans for staff review by June 30, 2014.

And Phase 2 involves providing additional protection for severe accident conditions through installation of a reliable severe accident-capable

drywell vent or development of a reliable containment venting strategy that makes it unlikely that a licensee would need to vent from the containment drywell during severe accident conditions. As you heard before, earlier today, the staff is continuing discussions with stakeholders on developing strategies and severe accident management, which would assist in the development of a technical analysis in support of the proposed rule. The rulemaking technical analysis is to be provided to the Commission in December of 2014 and the proposed rule in December 2015.

The next slide just provides a time line of implementation of Phase 2. But today's focus of this briefing is on Phase 1 of the order only.

This one is on the schedule of the ISG. This highlights the ISG schedule. We have the ACRS full committee scheduled for October 2nd. The ISG was published this morning in the Federal Register for public comment. The Federal Register number is 78 FR 57418.

Again, I would like to highlight the fact that we had substantial interaction with the stakeholders. As noted on this slide, we had six public meetings since issuance of the order in June. In addition, this copy was also discussed at the Senior

Managers Joint Steering Committee meetings between the NRC and NEI. There were two separate meetings in the past three months.

As we'll discuss later, there are still a few issues which are required for the discussions. We have a schedule of a next public meeting next Monday, September 23rd, to discuss those issues and any follow-up questions we may have from the subcommittee.

Also, as mentioned earlier, an industry group working under the NEI volunteered to develop a guidance document for the NRC staff review and endorsement. The scope of this guidance document, NEI 13-02, is broader than the scope of Phase 1 of the order. The draft ISG is endorsing this guidance document with clarifications and exceptions. With this, I will introduce Nageswara Karipineni, who is a senior reactor system engineer in Containment and Ventilation Branch in NRR and who will lead the staff's presentation on the draft ISG.

MR. KARIPINENI: Thank you, Raj. I tried to capture the purpose of the Order EA-13-109 because there's all these requirements stated in different places but never in any one comprehensively described in this model, five or six lines. So I tried to capture these things here. Decay heat in the order, licensees

or the industry believes that it can help in other ways in removing the decay heat.

So I said, okay, we'll assist in the removal in the decay heat with vents to containment atmosphere and controls the containment pressure within acceptable limits during those accident conditions (before and after core damage, including a breach of the vessel by molten core debris) for which containment venting is relied upon to preserve the capability to restore containment integrity. And what we meant by that is, you know, if you open it, you know, you have to restore it back in by closing it. It has to fully function during all these. That's the best definition I could come up with after reading several documents. We may find that it may do a couple of other things in the future, but, right now, that's what it is.

MEMBER ARMIJO: That's all you could find. That seems like enough.

MR. KARIPINENI: Okay. Again, Phase 1, Phase 2 you have heard so many times. Phase 1 right now in the order is the wetwell vent. It is an adequate protection issue, as well as a cost-justified safety enhancement.

Phase 2 is the drywell vent or reliable venting strategies that makes it unlikely for venting

from drywell. And that's a cost-enhanced safety enhancement. Right now, in the guidance document, not the ISG, the NEI 13-02, there are sections in that appendices that were left blank that will be wrote down in the future.

There are different time lines for implementation, particularly between Phase 2 and rulemaking. It was done in a way they all converge at some point, and we all agree what they are because there was quite a bit of nexus between the two.

The order, which is actually attachment to the communication that was sent to the industry to all these Mark I and Mark II containments, contains an order of requirement, and I tried to capture that here in the same order, as well as in our ISG. The past requirements are the implementation of Phase 1 and Phase 2, which I just talked about, and then -- go back to the next one. Okay. Go back. It's HCVS functional requirements divided into performance objectives and design features.

The performance objectives mostly talked about minimizing the reliance on operator reactions. It talks about plant operators exposure to occupational hazards: heat, radiological condition, etcetera, determine safe radiological conditions, and then

provide that controls and indications shall be accessible and functional under a range of plant conditions.

NEI 13-02, the key components provided in the guidance document, they would consider the heat stress impact, radiological conditions by use of selection of proper locations for these points, use of shielding, and make sure that the responders would not be placed in dose fields above the ERO guidance.

Other conditions are ease of vent valve operation. Again, they discuss about readily accessible locations. And the operations would not involve any use of jumpers, lifted heads to defeat interlocks, etcetera.

The third one is the -- I'm giving some main ones, not everything that was discussed in the document, obviously. The independent 24-hour electrical and pneumatic supplies by permanently installed equipment, that comes straight out of the order because it clearly stated that it need to be like that.

And the location of the controls in areas where sustained operation is possible, accounting for the radiological conditions in the vent pipe, and making sure that the locations of such will not place the operators above the maximum safe entry points allowed

by the plant safety guidance.

These locations, again, will consider the temperatures. They have these plant safety manuals that also talk about temperatures, obviously, what can happen if you lose ventilation of the cooling systems. They will look at those guidance that will provide they install at the proper locations to place the control panels. Lack of ventilation, obviously, will be considered because they're already looking at the fact that they don't have any ventilation.

Then the order gave a slew of requirements to the design features. These requirements talk about the vent capacity, the effluent discharge locations, minimizing the unintended cross flow, the 24-hour operation, capability to operate from the main control room or a remote location, means to monitor the status of the vent system, monitor the effluent discharge, withstand and remain functional during severe accident conditions. And it talks about the hydrogen issue, ensure that the flammability limits are maintained. And then it talks about testing, inspection, maintenance, etcetera.

These features, again, are addressed in NEI 13-02, in several sections of the document. Some of these key features are that the heat removal capability

will be determined based on auditable calculations that we can review; the effluent discharge through the main plant stack or a different stack, provided the different stack would be at least  taller than the nearest power block building and also it will be located away from any ventilation openings.  And they will consider the features for minimizing the cross flow by use of valves or leak-tight dampers because of the interconnections with the ventilation systems in standby gas treatment and check valves.  We haven't come across any exact use of check valves, but it was included in the document.

These interfaces will be designed such that they remain closed if they're already closed at the time of the accident, or they will automatically close if they're open at the time of the need to open the vent.

The document also talks about the preventing inadvertent actuation, key locks, administrative controls, etcetera.  Minimum 24-hour operation of installed equipment.  Basically, that being that, when an operator decides to open the vent, he can go to the control panel either in the main control room or at a remote location.  Just by maneuvering one or two switches, the vent will go open.  That's the whole idea here.  There's no operator to walk any places, take

any manual actions.

Monitoring the vent valve positions, containment pressure indications, effluent radiation monitor, all these things are included in the document. As far as hydrogen goes, they dealt with it in two places: in the main document itself and also in an Appendix H to the document.

There were several methods described there how they want to design for prevention of hydrogen migration, etcetera. They mention nitrogen inerted, steam inerted, exclusion of oxygen by pressurizing some portions of the vent system if there's a need for that. And then, finally, they will design the vent pipe to tolerate a detonation/deflagration. A couple of documents that were mentioned in this regard are the NUREG/CR-2475, and the Appendix H also made reference to quite a few documents as to how to design that system, where they're getting that information, etcetera.

There was a -- I don't have it written here. There was a document that was taken from a new reactor site. There's a NEDO-33572 that was done for ESBWRs that consider the gas migration and detonation and piping, and it takes some guidance from there also.

Operation, inspection, and testing. Basically, most of the requirements are checked every

once per operating cycle. Out of service times for the vent system were also addressed there: what if one control location is lost, what if both control locations are lost, and how much time they are giving themselves to fix the issue, etcetera. Lead testing, initially, before operation, as well as every three cycles they will do that because we put quite a bit of emphasis on the hydrogen part.

They would validate the procedures by open/close testing of the system often, and every two operating cycles there would be a complete test: actually run the switches and make sure they're open, go through all the interfacing locations and make sure they are closed, etcetera.

The third part of the order talked about quality standards. The standards are discussed in two parts. One is the containment isolation barrier itself, and the second is beyond the isolation barrier. The containment isolation barrier, the statement in the NEI 13-02 that it will be designed to the same requirements as the connected system or consistent with the current design basis of the plant.

Components not required to be seismically designed by the design basis of the plant, they claimed, consistent with our order, that they will be designed

for reliable and rugged performance that ensures HCVS functionality. They quote a couple of documents for that.

Basically, my belief is that if the vent is running through safety-related areas or safety-related buildings, different plants have different criteria. Some have actually designed them to be a safety-related pipe. As a matter of fact, with HCVS, any pipe in those buildings. Some plants have designed them only to 201 requirements. So the design basis for that plant is what the industry would like to follow but always ensure that the functionality of HCVS will remain under seismic conditions.

The guidance doesn't go too far into the details about stress analysis and all these things. But I would tend to say that whatever the design for the plant is, they would follow the same criteria, except for the fact that the functionality of the system has always got to be maintained.

CHAIR SCHULTZ: So can we just look -- I want to be sure I understand this part. The staff, there's not an exception here. The staff feels that what is in NEI 13-02 meets the objective of the order --

MR. KARIPINENI: Yes.

CHAIR SCHULTZ: -- with regard to these features?

MR. KARIPINENI: I believe so, yes.

CHAIR SCHULTZ: Good. Thank you.

MR. KARIPINENI: But it's not the exact criteria that all plants would be following. There would be some differences between the plants is all I was trying to imply here. Some plants, they use a Seismic Category 1 building, the system, even though it is non-seismic, non-safety related, may have been designed for Seismic Category 1 requirements, in which case they will do that. In some cases, it's not, but they will make sure that the functionality is maintained in their design. It leaves a lot open for them when it is just stated as rugged performance. As long as we're satisfied that however it is for different plants, you know, it is going to withstand in a seismic and afterwards of a seismic event with the function as required, that's --

CHAIR SCHULTZ: But what I was getting at is that the statement that you have here, taken from the NEI 13-02, you feel has provided that guidance --

MR. KARIPINENI: Yes, yes --

CHAIR SCHULTZ: -- for each --

MR. KARIPINENI: Yes --

CHAIR SCHULTZ: -- to move forward, if they choose to adopt this guidance, which is something that we hope they all do. But if they do, then the implementation will be compliant and there will be sufficient consistency, given the nature of their own licensing conditions?

MR. KARIPINENI: I think so, yes, yes.

CHAIR SCHULTZ: Good. Thank you.

MEMBER SKILLMAN: Do you have any, any sense that some of the BWR owners will not follow the NEI guidance?

MR. KARIPINENI: The NEI guidance always gives them the option of proposing other ways. They can always come and tell us that they would like to do it a little bit differently. We will know that in advance, and then we'd have to say okay or not okay. But, basically, at this point, this is the guidance to the industry. However, it always states that the industry, if they have other approaches, you can always submit it to NRC and get their okay.

MEMBER SKILLMAN: They'll submit it for evaluation, yes. Okay, thank you.

MR. DENNIG: This is Bob Dennig. I just wanted to say that, as far as knowledge of what the licensees intend to do or not do, the owners group folks

might have a better handle on that than we would. I don't think we have any direct information that, you know --

MEMBER SKILLMAN: Steve, did you want to comment here?

MR. KRAFT: Yes, Steve Kraft. Guidance is that: guidance. Same thing as reg guides from NRC. But the industry membership knows that if you don't follow the NRC as sort of say, hey, this is the way we'd like to do it, then you are going to be subjected to a review by the staff that may delay or whatever. That's not to say people don't come up with different ways of doing it. I mean, this is not a universal thing, to be sure.

But I think in this instance, because you have the extra added layer of the owners group going through the engineering guidance, you'll see a really good strict adherence to this, especially since we want to make sure that there's not a lot of variation in terms of NRC reviews, I mean, down to the point where we still have to add templates for reports and things along those lines. And those have proven to be very successful over the years.

So my expectation is you'll see pretty good compliance with this. But, then again, you know, it's

not the law, it is guidance.

MEMBER SKILLMAN: What I took away from the presentation that you gentlemen made, the industry made, was that there's a pretty high level of endorsement from the execs and from the plant people and from the design people for the BWR Mark I and Mark IIs, this is the way we should do it, let's get on with it.

MR. KRAFT: Right.

MEMBER SKILLMAN: That's kind of what I took away from what you gentlemen were saying.

MR. KRAFT: Well, you know, it's funny. Where you run into problems is not so much we're not going to do that. Where you run into problems is overkill on the part of utility engineering staff. You know, you take this guidance and you say, okay, now we're going to do this with great gusto, and that's not what management intended and it's not what's required. So it's really never the other way. It's really, it's, you know, overkill of what you're doing, which doesn't harm the safety aspect of it but it does unnecessarily raise the complexity and everything else and the ease of installation and stuff like that. Do you want to comment on --

MR. KRUEGER: Yes, I mean, I would agree with -- this is Greg Krueger from Exelon. I would agree

with everything said. The intent is to try to maximize the benefit of the owners group by making things consistent. There should be no reason for each BWR, each utility to go out and design some unique aspect of the vent.

The allowances here are the recognition that they have been built over a span of 20 years. The GDCs, some of the design requirements that have changed as time moved on have to be addressed. So, you know, at some plant, you might have to, you know, there might be some requirement to have only seismic 2 over 1 in a reactor building. There might be some higher-level guidance, and we don't intend to try to overrule that part. You know, the guidance will still say you have to meet your design and licensing requirements for your particular site. But everything else will be as consistent as we can drive that.

CHAIR SCHULTZ: Thank you. I appreciate you picking up on that because I wanted to get to it, and I'll make my comment now. There are so many facets to this rock that I would really hope for full organizational support for the overall effort from each of the licensees because there are so many different features and directions associated with all of the different parts of the puzzle. And it's very clear from

the discussions and from the documentation in the meetings that a lot of work is going into addressing this for this particular issue, but it's influenced by many other issues. So if deviations start to occur, it's going to be very complicated to address those deviations and pull it back in together.

MR. KRAFT: Well, we intended to be mindful of that, Mr. Chairman. First off, we didn't ask NRC to endorse EPG Rev 3, but it's in there because you have to know how the operators are going to operate in order to design correctly, particularly in such complicated beyond design basis severe accident space.

Secondly, you'll notice that the document does not follow the number and sequence of the order, which other guidance documents in the Fukushima series have. And the reason for that is that Greg and one other company, Constellation, got together with the people who would lead the design and asked the question: what would be easiest for you to follow? And we came up with an outline vetted by people who would lead the design that's easier for them to follow. It isn't easier for NRC to follow, right? So there isn't an appendix that's a crosswalk. That's a new thing for us, not following the NRC numbering sequence, because we decided this is so complex let's just lead people through it as

efficiently as possible.

CHAIR SCHULTZ: And the staff has worked on that piece of it in their ISG to make that connection to the order. I appreciate that.

MR. KARIPINENI: The other aspect of the seismic thing is it was clearly stated in the NEI that all the supporting analyses that were found for the seismic part of it is it will be auditable and it will be available for us for review, just in case we want to do that.

Then the order, the requirements in the order, the next requirements in the order are programmatic requirements. They talk about, the order talks about developing, implementing, and maintaining procedures, and train appropriate personnel in the use of the vent system.

The components, key components in NE 13-02, there will be procedures to operate, test, and maintain, and there's requirements there that they will system startup, shutdown, and off-nominal conditions; standby status; a number of things like that, and how they will coordinate with the procedures, the EOPs, the SAGs, and the FLEX; how they will demonstrate using the drills, tabletops, or exercises with other Post Fukushima measures.

Training will include initial and continuing training of the personnel and it will reference the guidance and procedures from EOPs, SAGs, and FLEX. And the training will also be refreshed on a periodic basis consistent with their plant procedure control process.

What we took out of the document is that, in general, we endorse the guidance provided in NEI 13-02. However, there are a few areas that we are either not endorsing now, we need to clarify, and provide some exceptions to what we are saying here.

We had extensive discussion in a previous session on the EPGS, SAGs, and the EOPs, SAMGs, etcetera. In the process of the meetings we had, they did bring these revised EOPs, SAGs and assured us where the changes are happening and all that. These are not formal submittals. We just got to see them for two or three hours. Because they're proprietary, you know, they took them away from us, basically.

In any case, the point we're trying to bring here is most of the procedures as to how to operate the HCVS is part of the work that we'll be doing in the future under Phase 2 in the rulemaking. What exactly, you know, is this doing for these other phases we are working toward, how are you going to operate that? Until we

come to some conclusion on all those things, we are not ready to endorse these procedures that they reference pretty extensively throughout the document. So we made a clear statement in the guidance document that right now we are not endorsing them.

CHAIR SCHULTZ: But I was trying to get an appreciation for how you would classify this, and I think you've explained it well that it has to do, it's not that this is an area that you're not endorsing, you just have not had sufficient either time or information or a connection to the overall process to be able to endorse it at this time?

MR. KARIPINENI: Connection to the overall process with the impending work that is happening in the next year or two.

CHAIR SCHULTZ: And the dialogue continues.

MR. KARIPINENI: And the dialogue continues. The other concern we have is, if you're designing to these current revision level of your documents which you're revising from Revision 2 to Revision 3, it's not yet even done, if you design for that, does the designer, could it potentially violate some of the other requirements? That's one of the concerns we have. We had them add a statement into the

NEI 13-02 that the order takes precedence over these procedures. In spite of that, we still want to state clearly right now that we are not ready to endorse these procedures.

CHAIR SCHULTZ: Okay. These next pieces, whenever you get to the clarification and exceptions, I want to be sure that we really understand the staff's position on those. As you said, I know you've worked hard, clearly, in the Interim Staff Guidance. But I want to be sure that we do, in fact, fully understand those today. Thank you.

MR. KARIPINENI: The anticipatory venting, the reason we are saying here right now we are not reviewing this part of it is because a process is taking place under the FLEX submittal reviews by the mitigating staff, the acceptance of the early venting part. Therefore, we didn't feel like we had a power action similar to that at this point, so that's why we stated there that this is statement is placed under the 12-049 reviews.

The Generic Letter 89-16, they talked about, the industry has talked about it --

CHAIR SCHULTZ: I'm sorry. Just to catch you again, there are not technical issues that you feel you're not going to be able to resolve with the NEI

document or the direction in which the NEI document you expect to lead the industry. It's rather that you see this as something broader than just this activity; and, therefore, there's more work ongoing and reviews are happening elsewhere, so it doesn't behoove you to address it and close it here?

MR. KARIPINENI: That's true.

CHAIR SCHULTZ: Okay, thank you.

MR. KARIPINENI: Right. The Generic Letter 89-16, again, there was a page-long appendix, and there is really no information that's related to the design of the hardened containment vent system. We felt like it has something more to do with their housekeeping purposes, that it is there and, to some point, that it's not there. We were not too concerned about it, and we didn't want to particularly state that, you know, we agree with everything you said here. That's the reason we are stating there it's not really the scope of the ISG requirements.

MR. KRAFT: If I could make a comment. Steve Kraft. Greg and I were just chatting. If the new vent that's being installed relative to EA-13-109 is replacing any vent you ever had, you may use some of the components, would it make some sense to formally rescind GL 89-16 so there's no confusion, the same way

you rescinded the original 12-050 order? I don't know what the implications of doing that are yet. We haven't studied it ourselves. But it just occurred to me, listening to this, well, why all this confusion in the first place? If the vent I'm going to install practically replaces the vent that I put in, maybe we just, you know, let's just make sure no future inspector gets confused or -- I'm asking the question. I don't know whether this is possible or not. Just a thought I just had.

MR. KARIPINENI: The GL 89-16 is sort of done under the 10 CFR 50.59 process. As the Fukushima incident has shown, there were some things about it. It's not our intent to go through that GL 89-16 completely again and say this is okay. For us, the vent really is this new vent that you would be using for the purposes of what GL 89-16 meant for. That's clear for us. So we don't feel that, in this Interim Staff Guidance, we need to say that we agree with what was said here.

MR. KRAFT: No, I'm not asking for that. I'm asking for a letter that says we hereby rescind 89-16.

MR. KARIPINENI: Oh, that's --

MR. KRAFT: I think that's something maybe

we have to get general counsels on either side to sort of think about that. I don't know what the implications are of doing that. I have no idea.

MR. AULUCK: Let me get back to you on that one.

CHAIR SCHULTZ: That would be a broader issue, Steve. I understand.

MR. KARIPINENI: The next thing is the drywell temperature issue. I think you all understood that the reason that it was even looked at now is because there is a portion of a common pipe when the wetwell vent and the drywell vent eventually converge someplace and go out as a single pipe. And that's one of the reasons why the industry felt that that common pipe temperature needs to be determined now so they can complete the wetwell vent design at this time. That was the main reason why it is even there in this document. Otherwise, it would have been plainly a Phase 2 issue.

MEMBER SKILLMAN: Well, just let me ask a question. If a plant owner were to say I'm going to complete Phase 1 without respect to Phase 2 and I'll put in a 325-degree farenheit 120 psi phase-one vent and I'll put in a second pipe completely independent for higher temperature, would that --

MR. KARIPINENI: Second pipe meaning --

MEMBER SKILLMAN: A second vent.

MR. KARIPINENI: Then that doesn't even need to get into this document right now. That temperature should --

MEMBER SKILLMAN: Okay. So this is a self-imposed temperature if I would have this medium portion temperature saturated vapor against this very high temperature capability. And it is an engineering challenge; I understand that. But there's nothing to prevent an owner, should that owner choose to have a second vent. Independent, completely independent.

MR. KARIPINENI: Yes, he can. The reason they are stating in here is because, at least a significant number of plants, it seemed like they were planning on how to do this.

MEMBER SKILLMAN: I understand that. And I'm not promoting that there should be. Steve, I'm not promoting. All I'm saying is that if an owner wanted to with a separate phase-two vent that owner could, as long as the requirements were met.

MR. KARIPINENI: Exactly.

MR. KRAFT: I appreciate your making that clarification. It actually was the other way around in that we had some feedback from some sites who said,

"You know what? We want to touch this system once --"

MEMBER SKILLMAN: Yes, I can see that.

MR. KRAFT: "-- so let's get criteria now." As it turns out, when we looked into it, that's a hard thing to figure out, and you can imagine based on this. So at least we were able to give them part of the answer. It really was the other way around. Every one will tell you to touch systems once, but it may not be possible in this sense. But also there's a Phase 2 out that says if you can do an analysis to the satisfaction of the staff that you'll never need a drywell vent.

MEMBER SKILLMAN: Strategy is the --

MR. KRAFT: Well, and I think, by knowing this number, you're sort of hedging your bet in both directions.

MEMBER SKILLMAN: Let me be clear I am not promoting a second vent. I just wanted to clarify if an owner wanted to that owner could.

MR. KRAFT: Right. And I want it understood on the record that we thank you very much for that. I don't want any manager to say to me why did you agree I have to put in a second vent? Thank you. I've been down that road before.

MEMBER SKILLMAN: So this 545 degrees brings up some very significant component procurement

issues. That's really a difficult one in design space. As my friend Erin can tell you, that's a hard one. Thank you.

MR. KARIPINENI: The staff's concern is we believe the head gasket, drywell head gasket is the most limited component when it comes to the gross leakage potential during the severe accident. And, therefore, we believe that the drywell vent or the alternative filtration strategies should protect the drywell head gasket from failure. Failing the drywell head gasket is also containment failure.

So we have the vent, you know, we vented, but still the head gasket failed. We don't think that's really the right way to look at this issue. That's why all the studies we're going to be doing soon and the calculations, etcetera, for Phase 2 and MELCOR analysis from research and everything, they will do subsequent work to show what that temperature could be, what if the drywell vent is there, what if the drywell vent is not there at those locations, is there a benefit out of that, and all these things we need to think about and answer those and determine what best temperature ought to be to prevent that kind of failure. This is where the staff is coming from on that issue.

And, also, we have subsequent work done

recently, a good amount of work from EPRI. In April 2013, they had put out a document about the failures of the head gasket, how likely to fail at the two times the pressure, that it can also fail at much less than two times the pressure and, if it fails once, it won't recede back properly and would continue to fail even at lower pressures afterwards. There's information there that need to be looked at before this issue is fully confirming what should be the temperature. That's where, in a short description, that's where the issues are for staff.

MEMBER ARMIJO: Do you have some views right now of what the temperature would be at which these gaskets are likely to fail?

MR. KARIPINENI: We can only look at what the, the body of work that was done on the SECY-0157. I believe there are some sequences there that took the temperature up as high as 700 degrees, 750, like that.

MEMBER ARMIJO: But from Fukushima, was there any --

MR. KARIPINENI: Fukushima. There's some information, and I'm not sure how final it is, but there is temperature raised into that range.

MEMBER ARMIJO: But they don't have any quantitative values that say this thing failed less than

545 --

MR. KARIPINENI: Not to my knowledge.

MEMBER ARMIJO: -- greater than 545?

MR. DENNIG: One of the contentions is to look at the data that's available through the Fukushima portal, the raw data, to see what -- I don't know that we've gotten to that yet, but that is one of the ones of comparison for making a decision about this.

MR. KARIPINENI: And the second part of the paragraph there is we also realize, as we agreed with the industry during the meetings, there's a design value, there is an ultimate value. Design values are generally considerably less than the ultimate values. We need to look at that also because it would be pretty hard to design this thing for that kind of temperature; we realize that. So we need to get all this information that's available out somewhere, including Fukushima, to see what is that ultimate value for this head gasket and seals are and if there is a way that that temperature can be limited by either the filtration strategies or by the drywell vent itself and make that the criteria for the temperature.

CHAIR SCHULTZ: So just to follow that up for a moment. Let me ask, let me ask the industry related to the diagram that you showed, pressure temperature

diagram that you showed, conceptual diagram I guess I would say. And so with regard to the drywell head gasket discussion or calculations, as a function of pressure and temperature that you get a straight line that goes across the top of that curve. And I'm sure there's some slope to that line, for example.

The question is where are you with regard to the calculations that would support the type of refinement or understanding as to what we ought to be thinking about with regard to that correlation and that protection?

MR. KRUEGER: This is Greg Krueger. That was a composite of information. There exists a NUREG-4944, which looks at the elastomer seals for the head. There was also a Sandia study that was done in `87 that also looked at severe accident seal degradation under severe accidents. What we did is we took all of that, along with the structural analysis from another NUREG. This diagram actually came from the Peach Bottom Level 2 PRA analysis we did, and we took all of those studies into consideration to develop this kind of composite. This is more of a cartoon, but there's an actual curve that we drew that's a pressure/temperature curve with probabilities that go along that curve that basically estimate what the failure potential is for

that given point in the curve. We do have that information, and it is based on a lot of the investigations from the 80s that went on for containment.

MEMBER REMPE: Hasn't there been data, though?

MR. KRUEGER: There is. I don't know how all that fits in there, but I'm sure there is. I'm just saying there is --

MEMBER REMPE: Some data from Japan that Dana talked about sometimes. And so I think it is a bit more --

MR. KRUEGER: Right, right. But there is a body of information already out there, and that's sort of what we used to develop that, rather than do a calculation.

CHAIR SCHULTZ: Right, I understand. But this is an area that was the one that I would identify as an area with at least technical controversy and yet a key need to come to agreement upon in order to move into Phase 2 and resolve it in the short time, relatively short time, when you think of all those things that need to be done, that's available. I'm glad that you brought up the information that has been assembled. How that helps get to resolution or agreement as to how to move

forward with the design and implementation is still a question it sounds.

MR. KRUEGER: Yes, absolutely agree. It's still a question, and I think we can bring to the table a lot of that supplementary information now and have additional discussions with the NRC staff to come to some closure on where we would land on those design parameters.

MR. KRAFT: Although I think that we need to make sure we don't confuse design and capability. What we're trying to do here is pick a design value off of a chart or a curve of capabilities. That's confusing because they don't represent the same thing. And so if you pick this point here, you know, where these two dotted lines come together, you'll now design and the capability of that system will reach out into these other areas, and that's not real obvious on this drawing. And, you know, I think it's important to know that if you pick a 545 design and you go out and you spec your equipment, okay, so that will survive into the seven and eight hundreds kind of temperature and higher pressures and, in fact, a designer will look at that and say, well, 545, you know, my supplier can give me a valve that will give me another couple hundred, you know, maybe ten percent more, gee, I'll get that one

instead. That kind of robustness is always being designed into systems. So that's why we are comfortable with this number.

CHAIR SCHULTZ: That's why Member Skillman brought this up because that's exactly the conversation that I'm sure you are having with the staff and it needs to be finally determined because, otherwise, things can go in a variety of different directions --

MR. KRAFT: Since the ISG is out for comments on this, through this now formal commenting period that we're going to resolve it, right? I mean, it's not something that we're going to keep lingering out there. At the end of October, it's resolved one way or another.

MR. KARIPINENI: As to what Mr. Skillman brought up about the vent, the pipe itself can take higher temperatures. That's not the issue. It's any components that may be located in the pipe.

MEMBER SKILLMAN: It's the valving.

MR. KARIPINENI: The valving.

MEMBER SKILLMAN: And supports and clamps.

MR. KARIPINENI: But those probably can be designed also, but the valving pipe, if the wetwell vent has the containment isolation valves don't end up with another -- we don't have any configurations of what this

looks like yet, you know. We have some rough ideas only. If that pipe in this common vent pipe doesn't have a component there, then at least that component issue is not there for this wetwell vent right now. But if the design ends up with some component that can open and close away from the containment isolation valve or another valve, that becomes an issue now with this 545. Is it the right temperature? Should it be more? And we are saying we cannot endorse this number until we do all this other work.

MEMBER SKILLMAN: I would like to ask industry another question, and this is just a really curiosity question. You know, a lot of us around the table have worked in plant engineering for decades, and so we've been around the hardware, we've been around the gaskets, we've been around the sealants. Have you considered getting a better gasket?

MR. KRUEGER: For the drywell head you mean?

MEMBER SKILLMAN: Yes, yes.

MR. KRUEGER: There has been some discussion about that. Certainly, for things that are smaller, like butterfly valves, there's tricentric valves that don't have any soft seals, compared to other types of butterflies. But, certainly, those are

absolutely under consideration for these higher temperatures. So there is a shift away from soft sealing surfaces. There has been some discussion with the drywell head, but there's a lot of other attributes that need to be considered relative to the containment design and some of those other, you know, non-design or design basis considerations we'd still have to step through.

MEMBER SKILLMAN: I was thinking like the 25th with the FLEX. Paint it closed, bolt it closed. If you take it off, it comes off like your head gasket on your car. Chips right off.

MR. KRUEGER: We'll have to get into that.

MEMBER SKILLMAN: It just seems to be obvious. If 545 is the gasket limit, you might say, well, is there something that is not expensive, is fully safe, that's material compatible, protection for almost no increase in finance. That's what was running through my mind.

MR. KRUEGER: And that goes back to the anticipatory venting. It's a pressure/temperature condition so that if the pressure stays low because you didn't anticipate an event early, the higher temperature doesn't affect the sealing surface as much because you don't have the pressure behind it. So there's that --

MEMBER SKILLMAN: Thank you.

MR. KARIPINENI: That has brought up, the SOARCA has some information on the backup information and the SOARCA analysis was done by research about the temperature/pressure relation when it comes to the drywell head gasket failures. As you all can understand, at pretty lower pressures, you need to have such a high temperature for failure. But at the higher pressures, it can fail at a lower temperature also. That's well documented in the SOARCA.

This slide talks about the instrumentation reliability and the operating environment. The industry has talked about it a little bit. This is something, I believe, that will be discussed in the next meeting on Monday. These comments kind of were late breaking a little bit, and that's why they were not discussed with them in the previous meetings. But based on what I heard this morning, there is probably some way that these can be resolved.

And one thing I did not mention in any slide was also that the industry guidance has referenced a number of documents in both the appendices and the main document when they were talking about different methods that can be used in complying with specific areas of the order, and we did not review all those references

in the full detail, not knowing, you know, which one of those methods a licensee would use. And, therefore, you know, we are withholding, in a sense, until we actually look at how the licensee is using that reference, in what ways and where. Then we'll determine if it's okay or not okay. But right now we can't tell that, and that's one of the reasons why we stated one of the exceptions, one of the clarifications in the document.

And then after that, I have a couple of observations that I want to mention here. As we said, we haven't seen any real schematics of the venting configurations in the NEI draft. What we have seen when the Order EA-12-050 was withdrawn, there were some licensees that have sent us some submittals on how they were meeting this 050. And so we have some idea on what is there. And our general feeling is that they were trying to create a reliable HCVS to the existing configurations, to the extent possible. And we don't have any objections to that. The only statement we would like to make here is that when we actually see it, we will consider it to be an acceptable method only if it complies with all of the requirements of EA-13-109.

There is some discussion about including some of the venting configurations into the NEI 13-02.

I don't think we have really reached an agreement or a conclusion on that yet, and we will know a little more this Monday when talk to them.

The last slide, this goes to a discussion about having a drywell vent and a filter. Section three to the enclosure one of the communication on EA-13-109, there is a statement there that licensees with Mark II containments can resolve the concerns about suppression pool bypass by alternative approaches to Phase 1 and Phase 2 requirements by the installation of the containment drywell vent with an installed engineered filter. And there is a process that they need to follow if they want to do that.

We believe that that alternative that we discussed there, in effect, really applies to both Mark I and Mark II containments. A drywell vent with a filter can most likely cross both Phase 1 and Phase 2 parts, not necessarily completing a rulemaking because we don't know where the rulemaking is going to go. But, most likely, it might meet the rulemaking also. So if a licensee desires to take that approach, we just repeated again in our ISG this is available to you as common approaches.

CHAIR SCHULTZ: So the order was issued, and it's issued in Phase 1 and Phase 2. Since the order was

issued, since before the order was issued and then after there's been 10 or 11 meetings with industry, out of which the NEI document was developed and the ISG has been prepared and out for public comment. And what you're saying here is you still believe that this is an acceptable way to go?

MR. KARIPINENI: This is an acceptable way to go. But the order itself did not contain these words. This is only a section that is not a legally-binding part, the way we were told --

CHAIR SCHULTZ: Yes, I understand that.

MR. KARIPINENI: -- contained a statement to that effect. And we continue to repeat that this is always available to you, we'll look at it and provide you the guidance or develop the guidance together again quickly if a licensee or licensees are out there that want to take this.

CHAIR SCHULTZ: Yes, thank you for reminding me it's in an enclosure. It's not in the order. That's what you're saying.

MR. KRAFT: This statement is in the body, it is in the document that has the caption on it that has the letter in it. The attachments are the technical requirements. In section three, it contains language about Mark II because, basically, for Mark II

containments that have bypass issues, that, if you do this other thing, you know, you solve the problem. That's what it says.

It is in a section of the document that our lawyers tell us have absolutely no effect because it is above the language that says "is hereby ordered." The way you know this is because it's in bold, it's in caps, and, you know, lawyers will tell you, from there on down, that's what you really got to do.

We persist on asking then why is it in the document at all? It doesn't belong here. This is the one issue that we have, you know, multiple arguments on because it just persists on confusing the issue because it's the rulemaking that will determine this, not this order. So I just don't understand.

Now, here in this ISG, it's going beyond Mark II bypass back into Mark Is, so we're making backward progress on what this was about. So this is one of the things we will deal with in our formal comments. I just don't see why this has to be -- I didn't see it in the first place, and I'm seeing it less now.

MR. DENNIG: We're just reminding that saying you have to use a wetwell vent is, in a sense, overly prescriptive. If the boundary conditions are

do something using only equipment that you already have installed or features you already have installed, do this. But that's, and that was the case back when 89-16 was written. It's not the case now. The order does say install a wetwell vent. Somewhere down the road not too far, some plants that don't have that feature or could benefit from having a drywell vent with a filter that have an economic or maintenance benefit from that would find themselves locked into doing something that, from an engineering or economic standpoint, might be sub-optimal.

So all we've done here is to point out that, historically, this has been developed using equipment already available in the plant and that the alternatives that developed since 89-16 should be considered if you find them to your advantage.

MR. KRAFT: Well, but then that begs the question that let's say ABC plant shows up and says, you know what, we like that order, we like that part, we'll do that. What's the criteria? What are the temperatures? We don't have any of that. NEI 13-02 didn't touch any of that, and the ISG doesn't provide any additional guidance. So it becomes, basically, a null set. Even if I want to do it, I have no idea how to do it.

So I'm going to have to come into NRC staff and say here's my plan and you give --

MR. DENNIG: Exactly, yes.

MR. KRAFT: -- endorsement.

MR. DENNIG: Exactly, yes. Case by case.

MR. KRAFT: Just, to me, it's a circumvention of the order. Oh, right, thank you. The rulemaking. Because parallel with the rulemaking, we have to do guidance, right? That's part of the requirement for rulemaking. So I think, again, Bob, we said this to each other many times before, it just, to us, confuses the issue.

MR. DENNIG: Not reminding people that this option is available or closed as an option in the rulemaking, effectively. Nobody who has already committed his honor funds to doing things in a particular way is going to, I think, wait until the outcome of the rulemaking to decide to go a different direction. So rather than preclude an option that I think the Commission wanted to have on the table, we just reminded people that there is this option if you find it beneficial. It's less prescriptive and providing flexibility to licensees who might benefit.

MEMBER ARMIJO: But it doesn't provide any guidance. It just says you can, you should take this

approach if you want to, but it has nothing to do with the NEI guidance.

MR. KARIPINENI: That is true. If they want to take that approach, they would have to take the exception. They'd have to come back to us and we will be willing to work with them.

MR. DENNIG: We've been through OGC, and they don't have a problem with this.

CHAIR SCHULTZ: Let's leave it at that then. Other comments?

MR. KARIPINENI: No, that's the last slide I have.

CHAIR SCHULTZ: So questions and discussions? Well, first I'll leave it just with regard to this presentation. We'll have the opportunity to present our comments, the Committee members will, in a few moments. But any other questions on the staff's presentation?

MEMBER SKILLMAN: No, not from me. Thank you.

CHAIR SCHULTZ: I thought I had one. The public comment period, how long is that?

MR. AULUCK: Thirty days.

CHAIR SCHULTZ: Thirty days, okay.

MR. AULUCK: So it's October 18th.

CHAIR SCHULTZ: Thank you. Steve?

MR. KRAFT: My apologies. Can we go back to staff's slide 24? I have a hard time understanding this paragraph. I think there's an inherent illogic in it. Read the paragraph backwards, and it seems to suggest that in NEI 13-02 we provided some diagrams as to what might be a way you could consider lashing out the valves and whatever, by definition, to meet the requirements of NEI 13-02. And that's patently incorrect. You still have to show you meet everything else. We can come up with a set of diagrams, which apparently we're going to try to do, and you run the risk of being very wrong when you do something like that if you don't understand every planned situation.

It says here that if the industry were to take this approach, which is try to use what you have, to the extent possible, it would be okay, providing the requirements of the order are complied with. Well, that's true under all circumstances. It just leads me to think that there is, and I know this is right which is why I suggest there's an illogic here, that the use of any diagram you might provide in NEI 13-02 does not, by definition, tell you you've met the requirements. And I think that's what this paragraph --

MR. KARIPINENI: What I was trying to say

is really that, in a desire to make as few changes as they can, if there is any likelihood that they violate some of these requirements, that we will go through them, critical reviews from us, and just bring that out here. But it was, nowhere in the ISG we have it written anywhere. This is just a precaution that I was telling here; that's all. You would think that reading of the vent guidance and all that there may be a whole significant number of changes that might be required. But based on the 050 submittal, we felt like there was not really a whole lot of changes there, other than maybe supporting the seismic a little better and all that. But here you have a lot of other things --

MR. KRAFT: 050 does not.

CHAIR SCHULTZ: I think it's okay, Steve. I understand, taken in the light of that comment, I think it's okay, as a precaution.

All right. At this point, I'd like to then open up the discussion to public comments, if there's anyone in the audience here in the room. Meanwhile, we'll open up the phone line for comments. But any members of the public in the audience who would like to provide a comment to the Committee, now would be the time. Hearing none here, I'll wait until the phone line opens. I know that it would -- the line is open. At

first, now that it is open, if there are members of the public on the line, if one of you would feel free to let us know that you are out there by stating your name and letting us know that you're on the line.

PARTICIPANT: We can hear you.

CHAIR SCHULTZ: You cannot hear us?

PARTICIPANT: Yes, we can. I just clarified that the line was open.

CHAIR SCHULTZ: That's what I was looking for. Thank you very much. Would anyone on the phone line then would like to make a comment, please state your name. Hearing none, we have no comments from the public on the phone line, so we will go ahead and close the phone line. And I'll ask members of the Committee for any final comments or questions, if you have them, but final comments associated with the presentation. Joy?

MEMBER REMPE: Well, I found the presentations by both the staff and industry very informative, and it was a very good and useful update for me. I'm glad to see that, before starting to think about how, the issue about management and who has control, it was an interesting discussion. It's something we've discussed informally, I know, a lot, as well as at the time when we were at Peach Bottom.

The need to have training and leadership and procedures, along with the vents, I think was a very important aspect, and I appreciated that discussion.

There was a mention about CAP and a white paper that was being prepared. Is there a schedule, or did I misunderstand that comment? I just was wondering what schedule --

MR. PARKER: Tom Parker. We're working to provide a document by the end of next week. I don't recall we had any specific information on CAP.

MEMBER REMPE: Oh, okay. I thought that there was going to be some sort of discussion about the need to think about CAP with respect to that. Maybe I misunderstood the comment.

MR. PARKER: We didn't have a plan to put that in the white paper. That wasn't an area for discussion, but we can consider that.

MEMBER REMPE: Well, I think it's something that's going to have to be considered at some point, and it will make the guidance and procedures much more complicated. I would be interested in hearing how that's going to be addressed at some point in the future.

MR. PARKER: Very good.

CHAIR SCHULTZ: The Committee would be

interested in hearing, to be more specific. There are members who are not here who would also be interested in hearing about it.

MR. KRAFT: We'll take that as an action --

MEMBER REMPE: That would be great. Thank you.

CHAIR SCHULTZ: Anything else, Joy?

MEMBER REMPE: No, that's it.

CHAIR SCHULTZ: Dennis?

MEMBER BLEY: Nothing further. It's a good day.

CHAIR SCHULTZ: Sam?

MEMBER ARMIJO: Very good presentations. I appreciate the effort that's gone into it from the staff and from NEI.

CHAIR SCHULTZ: Mike?

MEMBER RYAN: I was fairly impressed with the integrated actions and thinking and technical machinery and systems and all of that into kind of one coherent picture. I know you're still working on that, and that's something that you'll probably never get finished working on. But I applaud the fact that you were really thinking about getting reliability in human action aspects integrated with systems and

processes and whatever that you've set for taking action.

I heard several times individuals say things like, well, you know, it could change from what we think now or, you know, we're prepared for this but we're also prepared to move into a different phase if we see different things come, and I encourage that thinking because I think that's probably a critical kind of organized and well thought out flexibility that's going to make any eventual event much more manageable, as you're planning. And that's coming through to me that that's the way you're thinking about it. So I'm hope I'm right, and I think that's an excellent approach and keep going. Thank you.

CHAIR SCHULTZ: Dick?

MEMBER SKILLMAN: Yes. Thorough presentations from both teams. Thank you. I commend industry for an offering that makes sense, from a practical perspective, and also the staff for agreeing to accept the industry position, as industry has rolled out a very complicated approach that fits the BWR Mark Is and IIs. So this has been a good presentation from both teams, and I thank you.

CHAIR SCHULTZ: I would like to echo the comments by the members regarding the quality of the

presentations and the level of details that's been provided here this afternoon. The one comment I would make relates to the discussion earlier, and that is the way in which the industry guidance and the staff's endorsement of that guidance has proceeded through the public meeting process, again, both before the order was issued and then after it. And I know those meetings have not only included discussions related to this issue but because, as we talked about before, this issue is affected by an influences the other work scopes that are proceeding related to venting and containment performance and the overall process on the rulemaking associated with filter vents.

So that process is encouraged by this Committee because I think we've already seen how much fruit it can bear, and we look forward to it continuing. I know it's been a real effort by both industry and by the staff to keep that going, but it, I believe, is the only way that we can move forward and achieve the aggressive deadlines and goal sets that have been set for both the industry and for the staff.

I'm very encouraged by this particular project because it is drawing together, is drawing together all of those aspects that need to be developed and focused on in order to achieve the goals of the order.

So we'll be looking forward to hearing more.

And with that, I did want to indicate that the meeting we have with the full committee is, if I remember right, scheduled for about two hours.

MR. WANG: Exactly two hours, 1:30 to 3:30. 3:30 to 5:30. We changed it.

CHAIR SCHULTZ: Okay. So there's been a slight shift to accommodate Metro schedules, I guess. But we will, so we'll be looking forward to working with you on a presentation schedule that would meet up with that. But I think you certainly have the elements of the presentation that will be of most interest to the Committee.

Any comments by the members as to what you feel the members would like to hear in that presentation?

MEMBER BLEY: The differences part of the staff presentation. I think that's kind of crucial.

CHAIR SCHULTZ: Well, and just to follow on with the comment I made, I think the public meeting schedule and activities that you have had over the last six, four or five months, as it turns out, the value has been demonstrated by the products that could come from the combined efforts of the industry and the staff and the small number of clarifications and exceptions

that are in the staff guidance.

MEMBER BLEY: The differences, for the most part, were just things that haven't been reviewed yet.

CHAIR SCHULTZ: So we'll look forward to that presentation October 2nd. And any comments regarding letter writing? I think we're going to proceed, Sam. That's the feeling I get from it, and I think the Committee would like to put down our thoughts related to this subject.

With that, I'll close the meeting.

(Whereupon, the foregoing matter was concluded at 4:34 p.m.)

# NEI 13-02
# Industry Guidance to Implement EA-13-109

ACRS Fukushima Subcommittee

September 18, 2013


# General Characterization

- Cooperative effort between industry and NRC
- Numerous public meetings and technical exchanges to develop modified interim staff guidance
- Industry is working toward common design elements for implemenation of the order
- Good alignment between industry and NRC on guidance document with a limited number of issues needing resolution

# Functional Requirements

- Severe accident capability
- Limit containment pressure
- Vent capability from wetwell and drywell under ELAP conditions
- Control the use of common systems within and between units
- Addresses all venting modes

# Severe accident elements of EA-13-109

- Two phased approach (wetwell and drywell)
- Design vs. capability of system components
  - Hydrogen generation from severe accident
  - Core concrete interaction
  - Temperature and radiation levels

"The HCVS shall be designed to withstand and remain functional during severe accident conditions,... The design is not required to exceed the current capability of the limiting containment components." EA-13-109 criteria 1.2.10

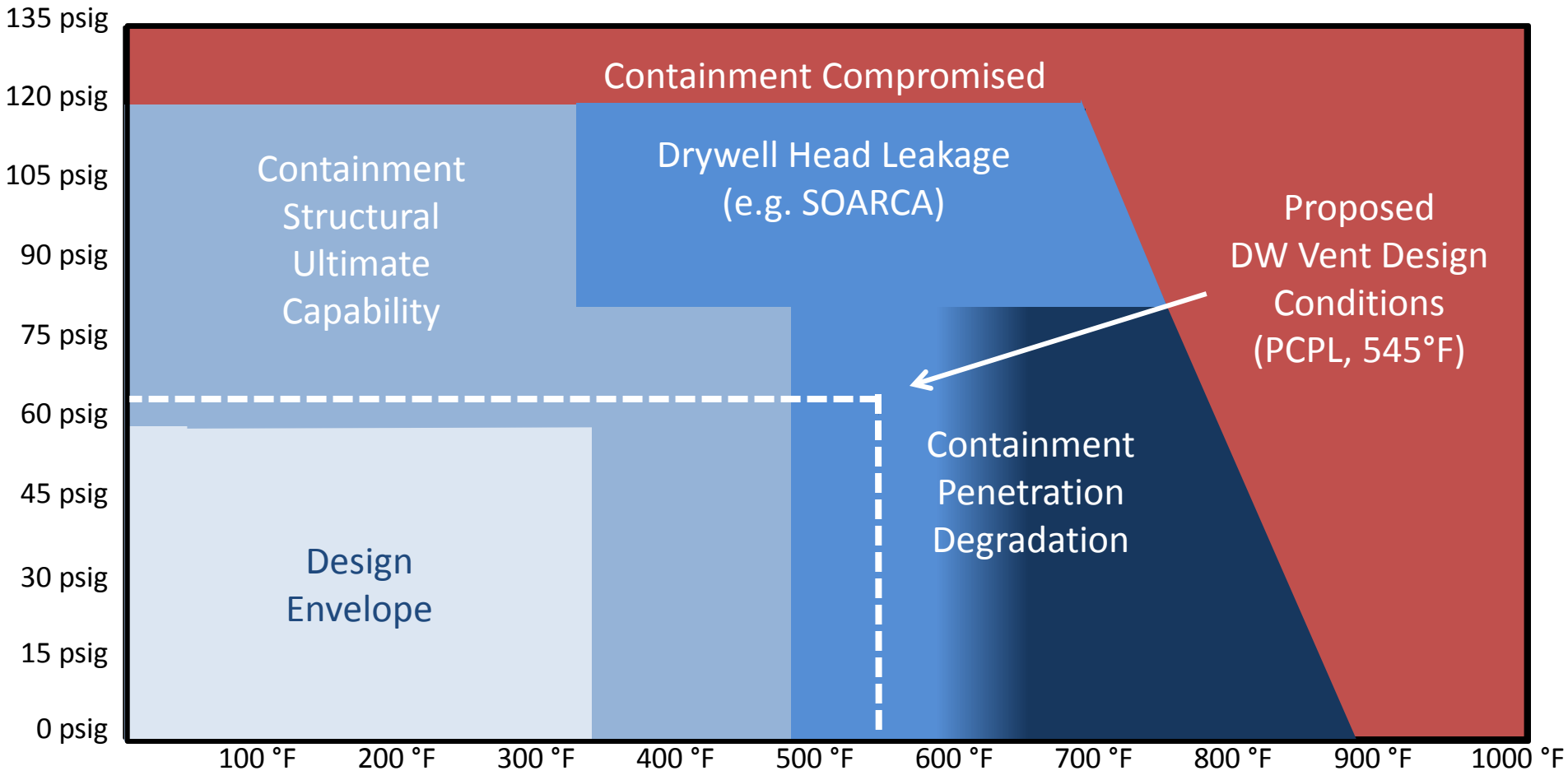
# Design Attributes

- Simplified operator actions with redundant controls
  - Prevention of inadvertant actuation
  - Habitability/accessibility under severe accident conditions
- Prevention of cross flow to buildings/systems/units
- Protection from flammable gas ignition
- Initial 24 hour operation with installed equipment
- Longer term operation to support venting function
- Wetwell design consistent with saturation conditions at containment pressure limits

# Topics for Further Alignment

- Drywell temperature design value
- Instrument qualification
- Anticipatory venting (FLEX)
- Accident management (EPG/SAG)
- Generic Letter 89-16 (Appendix E)

# HCVS DW Vent Consistent with Containment Capability



# Anticipatory BWR Venting

- Anticipatory Venting supports extended RCIC Operation for Mitigating Strategies/FLEX
- Preferred choice for Containment/Core Decay heat removal.
  - maximizes core cooling and containment function reliability
  - minimizes support systems and operator actions,
  - utilizes ≈10 times more efficient method of heat transfer
  - uses installed equipment
- Venting capability will be enhanced with EA-13-109 in BWR MK I & II

# Anticipatory BWR Venting

## New BWROG Guidance

## Allowed to Vent Containment When:

Containment Pressure > Scram Setpoint

**AND**

Required for core cooling*/lower offsite dose

*Maintain RCIC operation or allow low pressure injection

# Filtering Strategies Rulemaking

- Rulemaking assumes EA-13-109 modifications are in place
- Post Fukushima Lessons Learned implemented
- Dominant scenario and event tree development for rulemaking
- Performance based QHO margin screening versus ILCF and DF default values

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# Mark I and Mark II BWRs Containment Venting Systems

Guidance for Order EA-13-109

Briefing to the

Advisory Committee on Reactor Safeguards Subcommittee

September 18, 2013

Japan Lessons Learned

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# Agenda

- Overview and Schedule
- NRC staff presentation – Interim staff guidance development (JLD-ISG-13-02)
- Questions and comments

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# Overview and Schedule

# Overview - SRM

- SECY-12-0157 issued November 26, 2012
- SRM issued March 19, 2013
  - Modify Order EA-12-050 to include severe accident conditions
  - Develop technical bases for filtering strategies with drywell filtration and severe accident management of containments
  - Develop proposed and final rules for filtering strategies
  - Seek Commission guidance on use of qualitative factors in regulatory decisions

# Overview – Order EA-13-109

- Order EA-13-109 issued June 6, 2013
- Included a phased approach to ensure minimal delays in implementing adequate protection provisions and cost justified safety enhancements of the Order, while allowing possible development of alternate approaches
- Also included a 2-phase implementation of Order with subsequent incorporation of requirements into rulemaking activities, which would also include broader accident management strategies

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# Phase 1 - Scope

## Mark I and II

- Wetwell Venting System
- Requirements from EA-12-050
  - Reliable, hardened containment venting system
  - Adequate protection
- Revised order added Severe Accident Capability
  - Cost Justified Safety Enhancement

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# Phase 1 - Timeline

- Implementation :
  - no later than startup from the second refueling outage that begins after June 30, 2014, or June 30, 2018, whichever comes first.

- Integrated Plan
  - June 30, 2014

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# Phase 2 - Scope

**Mark I and II**

- Drywell Venting System
- Cost Justified Safety Enhancement

Options:

- Installation of severe accident capable drywell vent

Or

- Develop reliable strategy that obviates need for a drywell vent

# Phase 2 - Timeline

- Implementation :
  - no later than startup from the first refueling outage that begins after June 30, 2017, or June 30, 2019, whichever comes first
- Integrated Plan
  - December 31, 2015

# Schedule - ISG

- ISG issuance endorsing NEI 13-02 – October 2013
- ACRS Full Committee – October 2, 2013
- ISG issued for public comment – September 2013
- Public and industry interactions – June to August 2013
  - 6 public meetings/webinars
  - Next public meeting – September 23, 2013

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# NRC Presentation
# Draft Interim Staff Guidance
# (JLD-ISG-2013-02)

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# Interim Staff Guidance For Order EA-13-109
# Severe Accident Capable vent
# Mark I and Mark II Containments

- **Order EA-13-109**

**Objective is to assist in the removal of decay heat, vent the containment atmosphere, and control containment pressure within acceptable limits during those accident conditions (before and after core damage, including a breach of the RPV by molten core debris) for which containment venting is relied upon to preserve the capability to restore containment integrity.**

**Phase 1 – Wetwell vent**
**Phase 2 – Drywell vent or reliable venting strategies that makes it unlikely for venting from drywell. Place holders in NEI 13-02 (Section 3 and Appendix C) for inclusion of guidance at a later date for drywell vent or venting strategies.**

**Different timeline allows for consideration of the nexus between Phase 2 and rulemaking**

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# Interim Staff Guidance For Order EA-13-109
# Severe Accident Capable vent
# Mark I and Mark II Containments

## Order EA-13-109

– **HCVS Functional Requirements**

**<u>Performance Objectives:</u>**

**Minimize reliance on operator actions**

**Minimize plant operators exposure to occupational hazards**

**Account for radiological conditions that could impede personnel actions**

**Controls and indications shall be accessible and functional under a range of plant conditions**

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# Interim Staff Guidance For Order EA-13-109
# Severe Accident Capable vent
# Mark I and Mark II Containments

– **HCVS Functional Requirements**

**<u>Key components in NEI 13-02 for meeting performance objectives:</u>**

**Environmental considerations (heat stress impact, radiological conditions) Use of shielding and other radiological dose control actions such that responders will not be placed in dose fields above the ERO guidance.**

**Ease of vent valve operation (from readily accessible locations without the use of jumpers, lifted leads to defeat interlocks)**

**Independent 24 hour electrical and pneumatic supplies by permanently installed equipment**

**HCVS controls located in areas where sustained operation is possible accounting for radiological conditions in the vent pipe. Control locations will not place the operators above maximum safe entry points allowed by plant safety manual/guidance.**

# Interim Staff Guidance For Order EA-13-109
# Severe Accident Capable vent
# Mark I and Mark II Containments

– **HCVS Functional Requirements**

**Design Features**

**Vent Capacity, effluent discharge, minimizing unintended cross flow,**
**capability to operate from main control room or remote location, minimum capability to operate 24 hours by means of permanently installed equipment, means to monitor the status of the vent system, monitor effluent discharge for radioactivity, withstand and remain functional during severe accident conditions, ensure that lower flammability of gases passing through HCVS are not reached or system designed to withstand deflagration and detonation loading, and operation, testing, inspection and maintenance.**

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# Interim Staff Guidance For Order EA-13-109
# Severe Accident Capable vent
# Mark I and Mark II Containments

– **HCVS Functional Requirements**

**<u>Key design features in NEI 13-02</u>**

**Auditable calculations for vent capacity equivalent to 1% LTP.**

**Effluent discharge through plant stack or different stack (higher than nearest power block building and away from ventilation openings).**

**Minimize cross flow by use of valves, leak-tight dampers and check valves (remain closed or automatically close).**

**Prevent inadvertent actuation (key lock switches, administrative controls).**

**Minimum 24 hour operation with installed equipment**

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# Interim Staff Guidance For Order EA-13-109
# Severe Accident Capable vent
# Mark I and Mark II Containments

– **HCVS Functional Requirements**

**<u>Key design features in NEI 13-02</u>**

**Operated from main control panel and alternate/local valve control locations.**

**Monitoring for vent valve position, containment pressure, effluent radiation monitor.**

**Hydrogen – nitrogen inerted, steam inerted, exclusion of oxygen, tolerate a detonation/deflagration, principles in NUREG/CR-2475. Appendix H addresses the methods.**

**Operation, inspection, and testing – performed once per operating cycle. Out of service times for HCVS addressed.**

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# Interim Staff Guidance For Order EA-13-109
# Severe Accident Capable vent
# Mark I and Mark II Containments

- **HCVS Quality Standards**

- **Order EA-13-109**

  **Containment isolation barrier (consistent with the design basis of the plant)**

  **Beyond the isolation barrier (reliable and rugged performance that ensures HCVS functionality following a seismic event)**

- **Key components in NEI 13-02**

  **Containment isolation barrier up to second isolation valve will be designed to the same requirements of the connected system**

  **Components that are not required to be seismically designed by the design basis of the plant will be designed for reliable and rugged performance that ensures HCVS functionality (seismic details in ISG-JLD-2012-01 and ISG-JLD-2012-03).**

  **Components external to seismic category 1 (or equivalent building or enclosure) will be designed to meet external hazards that screen in for the plant as defined in NEI 12-06 (JLD-ISG-12-01 for Order EA-12-049)**

  **Auditable supporting analysis documentation**

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# Interim Staff Guidance For Order EA-13-109
# Severe Accident Capable vent
# Mark I and Mark II Containments

- **HCVS Programmatic Requirements**

- **Order EA-13-109**

  **Develop, implement and maintain procedures**

  **Train appropriate personnel in the use of HCVS**

- **Key Components in NEI 13-02**

  **Procedures to operate, test, and maintain HCVS will include:**
  **System startup, shutdown, and off-normal conditions; standby status verification; out of service controls; system components and equipment lineups; use of portable equipment and their storage location; validated for operator accessibility with normal power and backup power; coordinated with other procedures (EOPs, SAG, FLEX); demonstrate use in drills, tabletops, or exercises with other Post Fukushima measures**

  **Initial and continuing training of personnel expected to operated HCVS; training will reference specific guidance and procedures from EOPs, SAGs, FLEX); training will be refreshed on a periodic basis consistent with plant procedure control process**

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# Interim Staff Guidance For Order EA-13-109
# Severe Accident Capable vent
# Mark I and Mark II Containments

– **JLD-ISG-2013-02**

**Staff endorsement of the guidance in NEI 13-02 is subject to the following clarifications and exceptions:**

**EPGS/SAGs/ EOPs/SAMGs**

**NEI 13-02 contains many references to the BWROG generic EPGs/SAGs. Staff's believes the procedural requirements to operate and make use of HCVS including whether a drywell vent is needed during severe accident conditions will depend on Phase 2 evaluations and the related rulemaking. Staff's endorsement of NEI 13-02 is not an endorsement of the BWROG generic EPGs/SAGs or plant-specific EOPs/SAMGs.**

**NEI 13-02 included a statement at staff's request that the requirements of Order EA-13-109 takes precedence over any design features that may be required of the HCVS to facilitate the EPGs/SAGs/EOPs/SAMGs.**

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# Interim Staff Guidance For Order EA-13-109
# Severe Accident Capable vent
# Mark I and Mark II Containments

– **JLD-ISG-2013-02**

**Anticipatory Venting**

**References in NEI 13-02 for using HCVS to vent containment at lower pressure to facilitate the use of a low-pressure portable pump or to allow continued use of installed steam-driven equipment is currently being reviewed by staff as part of submittals under Order EA-12-049. Therefore, it is not addressed in this ISG.**

**Appendix E – Interface with the requirements of GL 89-16**

**Contains no information related to the design and implementation of the HCVS. Staff did not review Appendix E, as it is not within the scope of the ISG.**

# Interim Staff Guidance For Order EA-13-109
# Severe Accident Capable vent
# Mark I and Mark II Containments

– **JLD-ISG-2013-02**

**Severe accident conditions – Drywell Temperature**

**NEI 13-02 states 545°F**

**Staff position:**

**Drywell head gasket is presumed to be the most limiting component regarding gross leakage potential during severe accident conditions and therefore, drywell vent or alternate filtration strategies should protect drywell head gasket from over temperature and over pressure failure (as occurred at Fukushima)**

**Ultimate integrity capability values of the drywell head gasket need to be ascertained and used, instead of specification and environmental qualification values of the head gasket for this review**

**Results from Phase 2 evaluations and containment analysis being performed for rule making should also be taken into account**

# Interim Staff Guidance For Order EA-13-109
# Severe Accident Capable vent
# Mark I and Mark II Containments

– **JLD-ISG-2013-02**

**Instrumentation Reliability and Operating Environment**

**Effects of seismic, vibration and shock performance**

**Mounting and power requirements**

**Training, procedure development, surveillance routines for testing and calibration**

**Intrinsically safe**

**Flame proof or explosion proof features for hazardous locations**

**Habitability and accessibility**

# Interim Staff Guidance For Order EA-13-109
# Severe Accident Capable vent
# Mark I and Mark II Containments

- **Other Observations**

  **No schematic wetwell venting configurations included in NEI 13-02 draft.**

  **Licensee submittals pursuant to Order EA-12-050 indicate a variety of vent configurations were being contemplated. The submittals for most Mark I containments appeared to be aimed at fitting the reliable hardened vent requirements to existing configurations to the extent possible. If industry takes this approach, the resulting vent systems would be acceptable provided that all the requirements of Order EA-13-109 are complied with by methods endorsed in this ISG or licensee proposed alternatives that the NRC staff finds acceptable.**

# Interim Staff Guidance For Order EA-13-109
# Severe Accident Capable vent
# Mark I and Mark II Containments

- **Other Observations**

  **Section III to Enclosure 1 of the communication of Order EA-13-109 stated that licensees with Mark II containments may resolve concerns about suppression pool bypass by an alternative approach to Phase 1 and Phase 2 requirements by the installation of a containment drywell vent with an installed engineered filter.**

  **The ISG states that the above alternative, in effect, applies to both Mark I and Mark II containments.**

# Questions & Discussion