

Official Transcript of Proceedings
NUCLEAR REGULATORY COMMISSION

Title: Advisory Committee on Reactor Safeguards
Future Plant Design Subcommittee

Docket Number: (n/a)

Location: Rockville, Maryland

Date: Wednesday, November 2, 2011

Work Order No.: NRC-1243

Pages 1-96

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

+ + + + +

FUTURE PLANT DESIGNS SUBCOMMITTEE

+ + + + +

WEDNESDAY

NOVEMBER 2, 2011

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ROCKVILLE, MARYLAND

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The Advisory Committee met at the Nuclear
Regulatory Commission, Two White Flint North, Room
T2B1, 11545 Rockville Pike, at 8:30 a.m., Dennis C.
Bley, Chairman, presiding.

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SUBCOMMITTEE MEMBERS:

DENNIS C. BLEY, Chairman

J. SAM ARMIJO, Member

CHARLES H. BROWN, JR. Member

SAID ABDEL-KHALIK, Member

DANA A. POWERS, Member

JOHN D. SIEBER, Member

GORDON R. SKILLMAN, Member

JOHN W. STETKAR, Member

DESIGNATED FEDERAL OFFICIAL:

CHRISTINA ANTONESCU

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

8:29 a.m.

CHAIRMAN BLEY: This is a meeting of the Future Plant Designs Subcommittee.

I'm Dennis Bley, Chairman of the Subcommittee. ACRS members in attendance are Said Abdel-Khalik, Sam Armijo, Dick Skillman, John Stetkar, Jack Sieber and Charlie Brown. Christina Antonescu is the ACRS Staff Designated Federal Official for this meeting.

During this meeting, the staff will discuss ongoing issues related to closure of design acceptance criteria for new reactors. In particular, this briefing will include a discussion of the inspection strategy and specific procedures. The focus of the meeting is going to be on digital I&C DAC and piping DAC.

Everyone, this is really more of a keeping in touch session with the activities at Fukushima and the dropping out of South Texas from the tabletop process. As we understand it, there hasn't been a great deal of progress since our last meeting but we wanted to keep touch and see where things are headed and what it looks like in the future.

The Subcommittee will gather information,

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1 analyze relevant, excuse me, issues and facts, and
2 formulate proposed positions and actions as
3 appropriate for deliberation by the full committee.

4 The rules for participation in today's
5 meeting have been announced as part of the notice of
6 this meeting previously published in the *Federal*
7 *Register* on October 17th, 2011.

8 We have received no written comments or
9 requests for time to make oral statements from members
10 of the public regarding today's meeting. Also, we
11 have no requests for the bridge phone line listening
12 to the discussions.

13 If there's anybody on the bridge line,
14 please speak up, so we know that you're there.

15 (No response.)

16 To preclude interruption during the
17 meeting, the phone line will be placed on the listen
18 in mode during the discussions, and presentations, and
19 committee discussions.

20 A transcript of the meeting is being kept
21 and will be made available as stated in the *Federal*
22 *Register* notice.

23 Therefore, we request that participants in
24 this meeting use the microphones located throughout
25 the meeting room when addressing the Subcommittee.

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1 The participants should first identify themselves and
2 speak with sufficient clarity and volume so that they
3 may be readily heard.

4 We will now proceed with the meeting. And
5 I call upon Jim Beardsley to introduce the staff
6 presentation. Jim.

7 MR. BEARDSLEY: Good morning members of
8 the Subcommittee. I'm Jim Beardsley, Chief of the
9 Construction Inspection Program Branch in the Office
10 of New Reactors.

11 Our goal today is to provide you a brief
12 update on the activities that have been conducted over
13 the past year in the area of design acceptance
14 criteria and our ITAAC Inspection Program of that, of
15 the design acceptance criteria.

16 Over the past year, we put in place our,
17 a number of our inspection procedures. And we've been
18 working closely with the staff and the public to
19 develop our design acceptance criteria inspection
20 program. In particular, talking to the AP1000
21 community to make sure that they understand the areas
22 that we're going to inspect and that we understand
23 their schedule for expected development such that we
24 can ensure our inspection activity is scheduled in an
25 appropriate time. And we get an early look at their

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1 activities to ensure that they are progressing as we
2 expect.

3 Tom Fredette will follow with a detailed
4 discussion on those areas. Tom.

5 MR. FREDETTE: Thank you Jim.

6 Good members of the Subcommittee.

7 My name is Tom Fredette. I am the, I'm
8 from the Division of Construction Inspection
9 Operational Programs, Construction Inspection Programs
10 Branch.

11 Since November 2009, I've been the lead
12 for the task working group that was put in place to
13 address design acceptance criteria. Specifically,
14 design acceptance criteria inspection and how we would
15 resolve DAC as we transition from licensing in to the
16 construction environment.

17 This is a informational brief. It is one
18 of a series of periodic briefs that we hope to give to
19 the Subcommittee as we progress to keep you abreast of
20 our status and the progress that we've made in certain
21 key areas.

22 Today I wanted to provide the committee
23 basically a status of our activities over the past
24 year, with an emphasis on the infrastructure that
25 we've put in to place to address design acceptance

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1 criteria resolution, an overview of our approach to
2 the piping and digital I&C DAC that exists for the
3 AP1000 design, some insights from the limited activity
4 that we had with South Texas before they sort of
5 dropped off the radar screen. And then finally, an
6 overview of what we forecast for the coming calendar
7 year 2012.

8 Just for my way of continuity, I would
9 like to give the committee basically a brief time line
10 of what we have done over the past couple of years.
11 Since November 2009.

12 The, as I mentioned the working group was
13 established back in November 2009. We started on an
14 initiative with a South Texas project to address the
15 digital I&C DAC that existed for the Advanced Boiling
16 Water Reactor design certification document. We put
17 in an inspection framework in place basically to look
18 at South Texas project.

19 And we completed one inspection. That
20 inspection was for the digital I&C planning phase
21 documentation. And we conducted that back in June of
22 2010.

23 We briefed the ACRS a year ago on our
24 plans for 2011. And we committed, at that time, to
25 basically periodically brief you on the status of the

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1 working group.

2 As you all know, the South Texas project
3 suspended their activities related to their new units
4 3 and 4, basically, due to the Fukushima event that
5 happened in March of this year.

6 So the working group basically stepped
7 back and refocused our efforts toward the imminent
8 issuance of the licenses for the AP1000 design.
9 Basically the Vogtle plant and the VC Summer plant.

10 We've had some initial engagement with the
11 AP1000 Design Center Working Group over the last
12 several months. We've had two public meetings in the
13 area of piping design for the AP1000 design. And one
14 public meeting, just last week, our introductory
15 public meeting for the digital I&C DAC for the AP1000
16 design.

17 When I mentioned that we had shifted our
18 focus from the ABWR to the AP1000, that focus
19 basically entailed us concentrating on getting our
20 design acceptance criteria inspection procedures
21 finalized. And that's what, that's where the majority
22 of our efforts, over the past six or eight months,
23 have been focused.

24 CHAIRMAN BLEY: Just to raise two things.
25 Are you going to talk any more about what happened

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1 with STP?

2 MR. FREDETTE: Not really Dennis.

3 CHAIRMAN BLEY: Were there any surprises
4 at all in the one encounter you had on that one?

5 MR. FREDETTE: Well, I do have a slide
6 that addresses some insights that we --

7 CHAIRMAN BLEY: Okay. That's good. I'll
8 wait for that. Okay.

9 MR. FREDETTE: That's toward the latter
10 part of the presentation.

11 But we tried to capture all the lessons
12 learned that we could from our limited engagement with
13 them.

14 CHAIRMAN BLEY: And one thing, I'd ask you
15 now but maybe you can address as you go through it.
16 Our last meeting, which was some time ago, some of the
17 members were questioning how this can work because DAC
18 are so plant specific. How a single generic procedure
19 can work in this process. So if you can address that
20 as you go. Not right now.

21 MR. FREDETTE: I'll try. And if I cannot
22 I've got some technical experts here in the room who
23 have been involved sort of on an ad hoc basis with
24 development and review of our procedures to basically
25 help me out.

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1 CHAIRMAN BLEY: Okay. Thank you.

2 MR. FREDETTE: Just a quick overview of
3 our DAC inspection process.

4 As everyone knows DAC inspection is a
5 subset of ITAAC inspection. It's incumbent on the
6 applicant or the licensee to perform and complete
7 those ITAAC.

8 The staff basically verifies that
9 completion of those ITAAC through an inspection
10 process. And I have mentioned this before in past
11 briefings with the Subcommittee but it's verification
12 that the design, as implemented, will conform to the
13 licensing basis.

14 DAC inspection. We engage, we do
15 something different here. We engage the technical
16 staff in an inspection role to support the Region II
17 Center for Construction Inspection. That's
18 historically not how we perform field inspections but
19 for design acceptance criteria, because they, some of
20 them are very complex, we have branched out and we've
21 drawn from expertise that exists here at headquarters,
22 people that were engaged in the technical review of
23 the designs et cetera. And we bring them forth to
24 basically augment an inspection effort.

25 CHAIRMAN BLEY: Just administratively,

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1 they're part of the inspection team.

2 MR. FREDETTE: They are part of the
3 inspection team.

4 CHAIRMAN BLEY: Okay.

5 MR. FREDETTE: Just like a, just like a
6 consultant would be part of an inspection team that we
7 conduct inspections now for the operating fleet.

8 MR. BEARDSLEY: In general, we will
9 evaluate all of our inspection activity. And there
10 are many cases where we will draw on headquarters'
11 technical staff to augment or inform the inspection
12 activity.

13 For the DAC inspections that's a given,
14 up-front, they are a full up and in fact, we'll
15 probably have more technical staff members at some of
16 the inspections than we will regional inspectors.

17 So this is a, you know, a broader look
18 focused on these areas.

19 MR. FREDETTE: And just going back to the
20 South Texas briefly, Dennis, we had technical staff
21 members on that inspection team when we did our one
22 inspection back in June of 2010.

23 MR. ABDEL-KHALIK: You know when back when
24 we were discussing this about a year ago, the staff
25 used to push around a cart full of documents and

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1 reports to make the point that the safety case is not
2 just based on DAC but it's based on a lot of other
3 information. And to demonstrate that, they were
4 pushing all these documents from one meeting to
5 another. First of all, I'm surprised that I don't see
6 the cart here at the meeting.

7 And secondly, the point was that, in doing
8 these DAC inspections, presumably, you're going to
9 touch these documents to make sure that the design
10 will conform to the licensing basis.

11 So I would appreciate it if during your
12 demonstration you demonstrate that that's indeed the
13 case.

14 MS. DUDES: Let me just, oh this is Laura
15 Dudes, Division Director, Instruction Inspections.

16 The cart, just so we can clarify what the
17 cart was, remember, that was all the documents that
18 were reviewed to issue or write the safety evaluation
19 report.

20 MR. ABDEL-KHALIK: That's right.

21 MS. DUDES: So it was really illustrative
22 of the extent of the licensing review.

23 Now we're sort of, we're in inspection.
24 And I'm sure they may see some things at the site but
25 they'll be looking more at implementation at that

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1 point.

2 MR. ABDEL-KHALIK: Okay.

3 MR. BROWN: I do have a, on this slide --

4 MR. FREDETTE: Yes, Mr. Brown.

5 MR. BROWN: -- in the earlier meetings, in
6 some of the earlier discussions, including the ones
7 that Laura referred to back on the earlier design
8 projects, the comment was made that, when we go do DAC
9 inspections, those would be not sample inspections
10 they would be complete soup to nuts inspections. In
11 other words, every piece of DAC that was in, every
12 table, every list, every item would be detailed,
13 reviewed, and inspected.

14 When I looked and see just the lead in
15 words in the DAC DI&C, one it says, "Confirmation of
16 acceptable plans to control stuff. Evidence that the
17 plans were implemented. Evidence that the process
18 produced acceptable design outputs."

19 I see nothing relative to what I would
20 call a technical or a non-sampled complete as well as
21 a technical, if I say, process type inspection.

22 And that's not what I heard, that's not
23 what I remember hearing. My memory may not be all
24 that good from a year ago.

25 MR. FREDETTE: You're looking at the

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1 procedure, Mr. Brown?

2 MR. BROWN: Yes, I think it's the IP65 --

3 MR. FREDETTE: -- 001.22.

4 MR. BROWN: 22. Yes.

5 MR. FREDETTE: Yes sir.

6 Our philosophy, all along, and when I
7 briefed the Subcommittee a year ago I know I, I know
8 I emphasized this and I can go back and look at the
9 transcript, but our philosophy all along has been DAC
10 were already part of the targeted set of ITAAC. And
11 we would, we would sample each design acceptance
12 criteria item. Each design acceptance criteria
13 related ITAAC, we would look at.

14 But we would do that on a sample basis.
15 We don't have the resources to look at every single
16 item. Or the time frame to basically look at every
17 single item.

18 So what we have done is, we've, our
19 inspectors are trained and cognizant of the fact that
20 they must look at a sampled set. But it is a sampled
21 set of an already sampled targeted ITAAC. So it's
22 basically a sample of a sample is what the inspectors
23 are going to look at.

24 MR. BROWN: So it's even smaller than what
25 I may have presumed.

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1 MR. FREDETTE: Yes.

2 I think, we have used, we have used the
3 concept that we would look at every DAC, every DAC
4 ITAAC. But we would not, we would always look at
5 those on a sampling basis. And that's how we do all
6 inspections. It's always on a sampling basis.

7 MR. BROWN: Well that was one of the
8 concerns I expressed back when we were first talking
9 about a DAC, when I first got here, three, a little
10 over three years ago.

11 And because of the level, lack of level of
12 detail, technical detail, or the design detail that
13 was being proposed. So all you're doing is
14 reemphasizing that we're, these are really falling
15 down in to the an inspection, process inspection,
16 roughly.

17 That was the other part of my question.

18 MR. FREDETTE: Well --

19 MR. BROWN: As well as the lack of, not
20 many, but more of a process inspection than a detailed
21 technical --

22 MR. FREDETTE: -- well I --

23 MR. BROWN: -- inspection.

24 MR. FREDETTE: -- I wouldn't limit it to
25 just a, I wouldn't --

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1 MR. BROWN: I'm just reading the words out
2 of a --

3 MR. FREDETTE: I understand. But --

4 MR. BROWN: -- procedure. It's kind of
5 hard not to take that --

6 MR. FREDETTE: -- the inspection is
7 designed to look at both process and design output.

8 MR. JACKSON: Yes. This is Terry Jackson,
9 Chief of the Instrumentation Controllers and
10 Electrical Engineering Branch I in Office of New
11 Reactors.

12 And I think I kind of understand the
13 question Charlie is asking is, what kind of level DAC
14 would the inspection get in to for these different DAC
15 inspections.

16 And so for example, some of them, like if
17 you look at the, I'll say like the software
18 development phase, the planning phase is normally
19 something that we review. But some may be DAC.

20 And for example, an AP1000, Tom may get in
21 to it later, there is one where there is some planning
22 aspects for the AP1000, their components called the
23 "component interface module".

24 Most of those plans will probably be about
25 300 pages total. So if you send a team out there to

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1 go look at these plans, they should be able to even
2 look at them before they even arrive at the site, they
3 should be able to do a pretty comprehensive look at
4 300 pages of plans.

5 And when you get to the next phase where
6 it's, for example, the requirement specifications,
7 there may be about 10,000 requirement specifications.
8 And that may be, you know, several boxes full of
9 paper. And in that case, there will be more sampling
10 because, just because of the sheer size of the
11 information available.

12 But, so I would say in the planning phase,
13 that's where we more concerned in the licensing
14 review. And normally in the licensing review, if we
15 look at that we done that on other parts of AP1000
16 when we looked at the planning phase really
17 comprehensively.

18 We would do something similar in the
19 inspection phase as well. Because the size of the
20 information available would be small enough to
21 essentially review it in its entirety.

22 MR. BEARDSLEY: Yes. I think there's one
23 other point to be made. One of the processes or
24 approaches, we are taking in our sample is to try and
25 trace the requirements, planning, design,

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1 implementation, and testing. So we're going to pick
2 strings and look at how they play all the way through
3 the system to make sure that there's a robust process
4 there.

5 In addition, we're going to have non-ITAAC
6 quality assurance inspections of the multiple
7 processes associated with these developments. So
8 we're not only going to look at the ITAAC in
9 particular and these designs, we're going to look at
10 the licensee's quality control overall in their
11 processes. So we're going to look at the, you know,
12 the how they do it. And then make sure that they have
13 quality procedures in place and processes for all of
14 it.

15 So that gives us a greater assurance that
16 those areas that we don't do detailed ITAAC inspection
17 of are being controlled in a quality manner and that
18 are repeatable.

19 And that's, in general, the way we're, you
20 know, we're looking at the overall picture. So yes,
21 it is a sample. But it's an intelligent sample. And
22 we're also looking at other areas of their processes.

23 MR. BROWN: That still doesn't get you to
24 the point where you say, "Okay, we're going to do a
25 detailed quality, look at the quality and the quality

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1 of the process et cetera et cetera." Still doesn't
2 get you down to the design level where you see where
3 the DAC, in many circumstances, were, say we'll meet
4 the requirements of a specific IEEE603 criteria X or
5 part what, whatever the number is, for some particular
6 parameter. Independence, determinism, whatever.

7 But it does not, it does not address how
8 you get down and verify that the design actually
9 complies with those independence requirements. All it
10 does, it says, "Well, we got a process, the vendor is
11 suppose to design it in accordance with that process.
12 And therefore, since they have a quality process we're
13 going to assume that it's okay."

14 MR. FREDETTE: No, I think that's not
15 accurate Mr. Brown.

16 When you --

17 MR. BROWN: All I do, I'm reading the
18 paper as written. And I'm listening to the comments.

19 And then I -- I have no problem with
20 quality processes. It's just I'm trying to get a
21 handle on what that means. I'm not questioning your
22 integrity. Don't --

23 MR. FREDETTE: No. No.

24 MR. STETKAR: Charlie, let me ask him a
25 specific example.

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1 I'm looking at a set of DAC for a new
2 reactor design right now that shall remain unnamed.

3 And I look at one of the specified Tier 1
4 design features that is tabulated. It says, "The
5 system," because I won't give it a name uses
6 "energized to trip" and "fail-as-is" logic.

7 And the DAC says, "Well you know, the
8 acceptance criteria is, the system will indeed use
9 that kind of logic." It doesn't say how it's going to
10 use it. It doesn't say whether it's appropriate to
11 use energized to trip for these functions or fail-as-
12 is for these other functions.

13 All it says is, "The DAC will confirm that
14 it satisfies that criteria." That's doesn't -- I
15 could design a rock that does that. It is not
16 particularly a well designed safety system.

17 It's not been reviewed during the design
18 certification because it doesn't need to be reviewed
19 during the design certification. All it says is, "I'm
20 going to use some sort of logic." It does not say
21 "failsafe". So it obviously doesn't use failsafe
22 logic.

23 It uses "energized to trip" and "fail-as-
24 is".

25 And the design acceptance criteria for

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1 that portion simply says, and I won't give you table
2 numbers because I want to keep them anonymous, "The
3 system is capable of performing the functions as
4 described in that table."

5 MS. DUDES: I understand. This is Laura
6 Dudes, again.

7 MR. STETKAR: You --

8 MS. DUDES: I understand the line of
9 questioning.

10 One of the issues will continue to be
11 waiting to see what these inspections look like.

12 I mean, I'm confident that we have the
13 technical experts. And we do the deep dive. And we
14 do the physical validation that you're talking about
15 on the systems.

16 MR. STETKAR: The question is, would you
17 ever accept that notion for a piping system? I'm
18 going to sort of, kind of, get the water from point A
19 to point B through some sort of thing that might have
20 valves or pipes.

21 You would never accept that description of
22 a design for a fluid piping system. And just say,
23 "Well yes, they got it from point A to point B through
24 using some sort of, kind of, thing that used valves
25 and pipes."

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1 MS. DUDES: I, what's the --

2 MR. STETKAR: You would never, the Agency
3 spends tons of resources asking detailed questions
4 about the slope, the actual slope, of piping sections
5 for passive systems. "Show me, show me the aspect
6 ratios. Make sure that it's sloped in the correct
7 way. Make sure that a particular valve works as it's
8 designed. That all of the motor specifications are
9 correct," if it's a motor operated valve.

10 The amount of resources that is spent on
11 that level of the design for a piping system is not
12 commensurate with ensuring that a system contains
13 energized to actuate or fail as, and I'm sorry, and
14 fail-as-is logic.

15 MS. DUDES: Yes. I am sorry. I think I
16 just, maybe I'm misunderstanding.

17 MR. STETKAR: So I'm --

18 MS. DUDES: Are you questioning the design
19 that the licensing --

20 MR. STETKAR: I'm questioning the Agency's
21 review of that design.

22 When does the logically equivalent level
23 of review for a digital I&C design, when is that
24 performed, that logically equivalent level of review
25 compared to a hydraulic system design? And that level

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1 of review can't just say, "Well, yes, I took a look at
2 the design. And indeed, I'll check off the box that
3 indeed it has fail-as-is or energized to actuate.

4 MS. DUDES: Well again, I think --

5 MR. FREDETTE: That's the way those ITAAC
6 --

7 MR. STETKAR: I understand that's the way
8 the ITAAC, I understand that.

9 MR. SIEBER: That's the problem.

10 MR. FREDETTE: Well that sounds like a
11 licensing question.

12 MR. STETKAR: Oh well. I mean you guys
13 can't attack it because it's not your job to attack it
14 in the inspection world because it's a licensing
15 issue. And the licensing people said, "Well they're
16 allowed to do this in licensing space because that's
17 the way the rule was written. So we don't need to
18 attack it."

19 So nobody needs to attack it?

20 MS. DUDES: Well, and I think I've had the
21 privilege of following this issue from the Division of
22 Engineering and doing licensing. And now going in to
23 the Division of Construction and Inspection.

24 But I think the Agency and the staff has
25 made their determination on safety and licensing. And

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1 I think that alludes to the cart and the level of
2 detail that was used to make that determination.

3 I'm also confident, and I know the
4 procedures are often written, perhaps a little bit
5 more globally, but I've seen firsthand what our
6 inspection staff does and the qualifications of them.
7 And they do verify the quality assurance processes and
8 engineering processes. But they also do deep dive
9 physical validations of the technical requirements
10 that are in that licensing basis.

11 Now the distinction is, the inspectors
12 will be inspecting against that licensing basis.

13 Now as you talk about, well what type of
14 questions would be asked on a failsafe switch? Well
15 they will use their expertise and the available
16 guidance, and codes, and standards. All the way down
17 to looking at the seismic qualifications, looking at
18 the electrical configurations of that. So there will
19 be physical validation of that acceptance criteria.

20 And other inspections that we've done, do
21 the same thing. The approach to inspection is the
22 same. And it is a deep dive technical inspection that
23 verifies.

24 Now I think the sampling piece, is that,
25 we may not deep dive every single line. But we do

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1 deep dive. And as Jim said, "Follow the life cycle
2 and follow the technical aspects and physically
3 validate all safety aspects from one end of the system
4 to the other."

5 It just may not, if there's four trains,
6 we may not do four trains. Or there's you know
7 several systems that have a similar configuration, we
8 may do two to assure.

9 But the technical experts do do the
10 physical validation beyond just process control,
11 beyond quality assurance. So that they assure that
12 the technical merits are in accordance with the
13 acceptance criteria and the design certification.

14 MR. FREDETTE: Just to piggyback on what
15 Laura just said.

16 Inspection procedures are guidance. I, as
17 an inspector, do not rely solely on the inspection
18 procedure to guide me through an inspection. I rely
19 on any document I can get my hands on. To help me
20 out. Whether that be Tier 2 material, Tier 1
21 material, codes and standards et cetera et cetera.

22 CHAIRMAN BLEY: And I want to remind us
23 all of a couple of things.

24 Well first, I'd like to acknowledge that
25 Member Dana Powers has joined the committee.

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1 What we had hoped was through the tabletop
2 exercise at South Texas, and now I suppose that will
3 be through the inspection of the AP1000, that we would
4 get to observe how deeply these things were done and
5 how it would, how we would think it would have
6 corresponded if, you know, this had been a one shot
7 licensing arrangement and the whole design had been
8 here for review. So I think we're going to have to
9 wait until we see how that proceeds.

10 But at this point, I would like to go
11 ahead to have us brought up to speed with where things
12 are.

13 But we're going to have to really dig in
14 to that when it gets to a real application. But I,
15 talking theoretically about it now, I don't think it's
16 going to get us further than the last few times --

17 MR. STETKAR: I'll just --

18 CHAIRMAN BLEY: -- we had this discussion.

19 MR. STETKAR: -- you know, probe to see
20 what sort of --

21 MR. BROWN: Yes, the purpose of me
22 bringing the --

23 CHAIRMAN BLEY: I understand.

24 MR. BROWN: -- bringing this up was to try
25 to say, "Hey here's the issue, the concept of the

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1 problems we've had. And then now, what do we see
2 reflected in the actual procedures as they are being
3 performed? And how does that get translated relative
4 to the DAC and the other technical requirements that
5 we've been trying to get, at least, clarified?" I
6 don't know a proper good word for it but that's -- and
7 then, "How are they going to be verified." But I
8 wanted to get that base set based on the reading the
9 lead in to the procedures.

10 So I will thank you for getting this back
11 on track.

12 CHAIRMAN BLEY: Okay. And the other thing
13 along this line, I guess, I would like to suggest is,
14 you know we, the licensing review doesn't review and
15 redo every calculation.

16 So, what we need from staff is some
17 perspective on how the combined process of the license
18 and then the inspection would match up on technical
19 issues with a one shot complete review of a complete
20 design.

21 So Tom, back to you.

22 MR. FREDETTE: Thank you Dennis.

23 Just a final point on, a final couple of
24 points on this particular slide number 4.

25 Our process relies heavily on the

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1 licensee's construction and ITAAC schedule. In other
2 words, AP1000, as an example, they have a, or for
3 Vogtle and Summer, they have a construction schedule
4 that's in place. And construction activities that are
5 tagged or related to a specific ITAAC, we're cognizant
6 and aware of those.

7 We try to engage our inspection effort or
8 match our inspection effort to the licensee's
9 schedule. And I'll talk more about that a little bit
10 later.

11 Finally, just a review for everyone. All
12 our results are documented in an inspection report
13 just like any ITAAC inspection. And they'll be
14 archived to support the future ITAAC closure process.

15 In to the procedures, we have, we have two
16 procedures that are related to piping DAC. They are
17 for the piping design. Inspection procedure 65001.20.
18 And the pipe rupture hazard analysis procedure which
19 is .21.

20 And we also have the digital I&C procedure
21 that Mr. Brown has been looking at. It has six
22 attachments to that procedure. Basically, it's
23 designed to generally mirror a typical visual system
24 software development life cycle.

25 And finally, an initiative that we just

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1 kicked off -- yes sir.

2 MR. BROWN: Okay. That was another -- I
3 can't stop myself.

4 You just said, "The typical software
5 development life cycle". But the entire system is not
6 just the software. The software development cycle is
7 a piece of the overall technical design relative to a
8 its independence, redundancy, determinist behavior,
9 diversity and defense in depth, all that kind of
10 stuff. It's a piece.

11 MR. FREDETTE: Yes sir.

12 MR. BROWN: It's a critical piece.
13 Because it has certain things we have to be concerned
14 about.

15 But the fundamental architecture of the
16 system is not embodied in, the hardware architect is
17 not embodied in the software development cycle.

18 MR. FREDETTE: No.

19 But we do address the hardware elements in
20 a portion of our procedure. Okay. In those, in the,
21 I believe it's Attachment 3.

22 And Mr. Santos is here to --

23 MR. SANTOS: This is Dan Santos, Office of
24 New Reactor, Division of Engineering.

25 Mr. Brown, there will be also ITAACs

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1 verifying several of the system attributes
2 architectures, hardware elements. And you are
3 correct. It needs to be a system look. And that's
4 what we intend to do.

5 So the combination of that, and as I
6 stated, ITAACs will provide a comprehensive look at
7 the entire system.

8 MR. FREDETTE: The inspection manual does
9 include an ITAAC inspection procedure that's geared
10 towards I&C systems. Which includes architecture.

11 MR. BROWN: But not this procedure.

12 MR. FREDETTE: Not this procedure. This
13 procedure is a DAC procedure.

14 MR. BROWN: Well, but if you go look at
15 the DAC for some, for a number, I mean, I just went
16 back till I found it. And looked at a stack of the
17 DAC for one of the particular new projects.

18 MR. FREDETTE: Mm-hmm.

19 MR. BROWN: And there's all types of
20 hardware type that you would perceive would be
21 hardware type DAC in there.

22 MR. FREDETTE: I understand.

23 MR. BROWN: And yet, they're not
24 encompassed as part of the overall DI&C --

25 MR. FREDETTE: As I --

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1 MR. BROWN: -- DAC procedures.

2 MR. FREDETTE: -- yes, as I mentioned Mr.
3 Brown, this procedure is guidance. Okay. It is
4 designed to be married to other inspection tools that
5 an inspector can call upon when he is in the field
6 doing an inspection.

7 And that could include the corresponding
8 ITAAC procedure for I&C systems. It could include
9 other procedures for things like EQ or environmental
10 qualification. Other procedures related to a
11 procurement, testing, you know, what have you.

12 The inspection manual has got hundreds of
13 different documents that an inspector can call upon.

14 MR. BEARDSLEY: Every ITAAC, including the
15 DAC ITAAC, are divided up in to families. For AP1000,
16 there's approximately 70 families.

17 Each family has a minimum of two
18 inspection procedures that are particularly targeted
19 to that. One will be specific to one area. And
20 another will be specific to another way to look at
21 that family. Those are the starting points for the
22 inspection.

23 We developed the DAC inspection procedures
24 to augment that inspection planning process. Because
25 we felt that there were some areas that weren't

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1 covered in those initial set of inspection procedures.

2 So they're going to use, start with the
3 two, the row and column procedures, they're going to
4 start with the DAC procedure. And then they're going
5 to delve in to particular codes and standards as part
6 of the planning process.

7 So when we go look, do a DAC inspection,
8 we call it a DAC inspection, it's an ITAAC inspection,
9 it's going to look in multiple ITAAC. And we're going
10 to draw on, as Thomas said, many different procedures
11 and different, you know, resources to look at it.

12 So by reading our DAC digital line I&C
13 inspection procedure, it gives you the way we would
14 address the software development. In particular,
15 software development life cycle.

16 But there's many other aspects that are
17 addressed in other inspection procedures that we will
18 bring together as part of those inspections.

19 MR. FREDETTE: And just to clarify the
20 genesis of this is that when South Texas approached
21 the staff with a schedule for when they were going to
22 submit some of their design implementation detail, we
23 had no procedure to address software. This was it.
24 So we had procedures to address instrumentation and
25 control systems. But we had no procedure to address

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1 digital instrumentation and control systems,
2 specifically, software development. So that's where
3 this procedure came from.

4 MR. ABDEL-KHALIK: Section 02.04B of the
5 piping procedure says, "The level of review should be
6 guided by inspector experience." Can you tell me what
7 that means?

8 MR. FREDETTE: Let's see. 0204. I'm
9 sorry. I --

10 MR. ABDEL-KHALIK: B. The very last
11 sentence.

12 MR. BEARDSLEY: Well I think it goes to
13 selecting your sample.

14 And so, what we're going to do is, the
15 team is going to take the procedure and look at the
16 particular area or that ITAAC that's going to be
17 inspected at that particular time.

18 As Tom pointed out, we have access to the
19 licensee's very detailed construction schedules. So
20 we'll know where in the development life cycle they
21 are with the particular systems. And we'll use that
22 as a piece of our planning process.

23 MR. ABDEL-KHALIK: No, just read the
24 sentence.

25 MR. BEARDSLEY: I read the sentence. So

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1 --

2 MR. ABDEL-KHALIK: It says, "The level of
3 review should be guided by inspector experience."
4 What does that mean?

5 MR. BEARDSLEY: Well, you're going to take
6 the regional inspectors combined with our headquarter
7 scheduling staff, and Jennifer I think will be able to
8 address that part of it, and they're going to get
9 together and look at the system that they're
10 inspecting. And based on their experience in
11 licensing, and from being inspectors in the field
12 looking at those systems, they're going to develop the
13 sample that they'll look at for that particular
14 inspection.

15 MR. ABDEL-KHALIK: So this, in your view,
16 this just sort of is limited to how they select the
17 samples? Rather than the manner in which they conduct
18 the review? And that in-depth level in, at which the
19 review is being conducted?

20 MR. FREDETTE: It's a little bit of both.

21 MR. BEARDSLEY: Yes.

22 Go ahead Jen.

23 MS. DIXON-HERRITY: My name is Jennifer
24 Dixon-Herrity. I'm the Chief of the Engineering
25 Mechanics Branch II.

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1 My staff had some input in to putting this
2 inspection procedure together.

3 If they actually complete it, this portion
4 of the design before licensing, we would have been the
5 ones to review it.

6 And the intent of that line item was based
7 on the way that my staff would have audited the
8 design. They would look at the design and they would
9 look for areas where problems were experienced in the
10 past in designs.

11 For example, they would look for lines
12 where stratification occurred. And those would be the
13 ones that they would look at first as they went
14 through and picked their sample.

15 So the intent was to go back to the design
16 experience that we've seen and to look at those
17 portions of the design to verify that they have
18 addressed difficult areas appropriately.

19 MR. ABDEL-KHALIK: Okay.

20 MR. BEARDSLEY: And I think to augment
21 that, we're also going to have the inspectors from the
22 Center for Construction and Inspection who are doing,
23 you know, piping inspections on a day-to-day basis.
24 And that they have seen areas through their experience
25 with the way the licensee has been building the

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1 systems, with the way they've been delivered. They're
2 going to add to that to their sampling methodology as
3 well. So we're going to delve in to areas that we
4 feel that we may want to look at more closely based on
5 experience as we grow that body of knowledge during
6 the construction process.

7 MR. FREDETTE: And it's on a case-by-case
8 basis. Every inspection is different. And every time
9 an inspector plans an inspection, they may do
10 something different than they did the previous
11 inspection based on other tools that they can bring to
12 bear. Operating experience, construction operating
13 experience, industry experience, not outside nuclear.
14 In other words, if there has been, if there are
15 insights that they can gain from petrochemical or
16 other industries, they'll bring that in also.

17 Okay. All right. The last bullet on this
18 slide number 5, I just, we will talk very briefly
19 about the inspection procedures for human factors
20 engineering DAC.

21 And specific to, they're design specific.
22 And that effort, the development of those procedures
23 is, has sort of gotten a late start compared to the
24 digital I&C and the piping procedure development.

25 I'll talk about the human factors

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1 engineering procedure first. Basically it's four
2 different procedures to address four different
3 process, inspection processes. Integrated system
4 validation, task support, design verification. And
5 then finally, as-built configuration verification once
6 the simulator is put in place.

7 It addresses elements that are found in
8 NUREG-0711 which is the human factors engineering
9 program model. All the attributes that are in that
10 NUREG, basically, have been pulled out and are going
11 to be incorporated in a new inspection procedure.

12 We planned for multiple attachments to
13 those procedures to address the different, the
14 specifics of each design. So there will be an
15 attachment for AP1000. A different attachment for
16 ABWR. And so on.

17 The status of that procedure as, I had
18 mentioned, it sort of got a late start. It's in
19 development now. We expect a draft in mid-2012.

20 MR. BEARDSLEY: And that supports the
21 current schedule as the licensee's documented it. So
22 we don't see any particular issue with that
23 development of that procedure, holding up our ability
24 to go do the inspections of their HFE life cycle.

25 CHAIRMAN BLEY: The as-built part of this,

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1 I don't remember what were DAC and what were -- the
2 procedures themselves DAC? The operating procedures.

3 MR. FREDETTE: You know, I --

4 CHAIRMAN BLEY: Did they get looked at
5 somewhere by, for just --

6 MR. FREDETTE: For just human factors?

7 CHAIRMAN BLEY: Yes.

8 MR. FREDETTE: Well Paul Pieringer is here
9 from the staff. And he is our, he is our resident
10 human factors expert.

11 Paul, do you want to address that?

12 MR. PIERINGER: Yes. Paul Pieringer,
13 Human Factors, DCIP.

14 The operating procedures are part of an
15 operating program. They're addressed in Chapter 13.

16 As part of that operating inspections,
17 there's a procedure generation package which contains
18 a writer's guide which contains human factors
19 direction for how to write procedures.

20 CHAIRMAN BLEY: That, I remember.

21 MR. PIERINGER: And that is the criteria
22 we inspect against. Is that writer's guide.

23 There are other parts of the writer's
24 guide that get inspected as part of the operating
25 program. But it's all done under operating program

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1 inspections.

2 CHAIRMAN BLEY: And when do those happen?
3 After operations begin or before?

4 MR. PIERINGER: They're supposed to,
5 they're scheduled three months prior to refueling. Is
6 the date. They have a --

7 CHAIRMAN BLEY: So there's no operations
8 inspections that would look at those before the first
9 fuel load and start up. Is that what you're telling
10 me?

11 MR. PIERINGER: The only inspection I know
12 of is that one. I don't know of any others that are
13 done before.

14 CHAIRMAN BLEY: Okay.

15 MR. PIERINGER: So yes, you are correct.
16 Based on my knowledge.

17 CHAIRMAN BLEY: So we never kind of
18 officially look at the actual procedures until some
19 time after operations begin. It may have always been
20 this way. I don't know. I'm just --

21 MR. BEARDSLEY: I think Paul said, "Three
22 months prior to fuel load."

23 CHAIRMAN BLEY: No, he said, "Prior to
24 refueling," actually.

25 MR. BEARDSLEY: He meant --

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1 MR. PIERINGER: I meant fuel load.

2 CHAIRMAN BLEY: That makes me happier.

3 Thank you.

4 MR. BEARDSLEY: Three months prior to fuel
5 load, which is, you know, before, not well before but
6 will be definitely before operations. We will, you
7 know, at the minimum, that's when we will look at
8 these.

9 But again, like the other procedures we're
10 going to track the licensee's development schedule for
11 all these activities.

12 CHAIRMAN BLEY: And they're going to be
13 training people at least a year --

14 MR. BEARDSLEY: Absolutely.

15 CHAIRMAN BLEY: -- before.

16 MR. BEARDSLEY: Well before. Yes.

17 MR. FREDETTE: I have a time line that
18 shows some of that also.

19 CHAIRMAN BLEY: Okay.

20 MS. DUDES: I just want to make sure we
21 don't lose the fact that we have an expensive operator
22 licensing program both here and headquarters, and with
23 Region II.

24 And we will, the NRC, will actually issue
25 the licenses for these operators well ahead of fuel

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1 coming in.

2 So we need SROs before you can bring that
3 fuel in. So this will, this will take place several
4 years before construction, in terms of, on the job
5 training, exams, simulators, and all that.

6 So we're not going to just inspect
7 operator licensing three months before a fuel load.
8 This is a heavy effort before.

9 And we expect actually the operators to
10 start coming on to site several years before we're
11 near that point. So.

12 MR. ABDEL-KHALIK: But that process of
13 qualifying the operators, does not necessarily focused
14 on the adequacy of the procedures. Does it?

15 MS. DUDES: Well, but those issues can get
16 ferreted out during, while you are testing people with
17 the simulator, while they're doing OJT and developing
18 that out.

19 I think it's, I think it's not a one, one
20 procedure is going to cover all of that. I think our
21 operator licensing procedures will, inspections will
22 be comprehensive.

23 But there's a lot of other activities that
24 lead in to that, that support the safety of the
25 facility.

1 MR. STETKAR: In terms of the schedule Tom
2 was talking about, those procedures, regardless of the
3 quality of the procedures that you may be concerned
4 about, they need to be written in some coherent
5 fashion. And in place to support the operator
6 training.

7 So therefore, you know, auditing against
8 a style guide and kind of sampling the procedures from
9 a human factors standpoint to make sure that they hang
10 together correctly, can be done, you know,
11 substantially before a fuel load. Even though the
12 requirement may only be, nominally, three months
13 before a fuel load. The opportunity exists to do that
14 quite early on.

15 MR. PIERINGER: And one example I would
16 give you of that is the integrated system validation.
17 It's the procedures, operators that have gone through
18 some training programs for the ISV process. And of
19 course, the control room design. And then they run
20 through up to 23 different scenarios exercising those
21 three facets together that ensure that they all work.

22 And that's done, well I'd have to look at
23 it, but at least, like, two years ahead because you've
24 got this training cycle that's being described. It
25 has a lot of series activities that take place.

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1 CHAIRMAN BLEY: That has nothing to do
2 with what we're doing here. On human factors
3 engineering. Because this sets the framework for
4 laying all of that out.

5 But I mean that's an operations
6 inspection. It's not a DAC inspection.

7 MR. PIERINGER: The innovative system
8 validation is actually one of the, is a DAC.

9 CHAIRMAN BLEY: Is a DAC. Okay.

10 MR. PIERINGER: And it's going to be
11 guided by the first procedure on the list up there.

12 CHAIRMAN BLEY: Okay.

13 MR. PIERINGER: It's one of our, we
14 consider it the most important of the DAC inspections
15 we do because it is the integrated demonstration that
16 the operators, the procedures, and the control design
17 work together --

18 CHAIRMAN BLEY: All work together.

19 MR. PIERINGER: -- effectively.

20 CHAIRMAN BLEY: That's very helpful.

21 Thanks. But we'll see these in a year or so.

22 MR. FREDETTE: Well you'll see them, well,
23 the next time we brief the Subcommittee we should have
24 those procedures in place then.

25 CHAIRMAN BLEY: Okay.

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1 MR. FREDETTE: Thank you, Paul.

2 For the piping and the pipe rupture hazard
3 analysis, two years ago when the task working group
4 was formed, we commissioned development of a strategy
5 document basically that would, that would be
6 developed. And it would sort of highlight what these
7 procedures would look at.

8 The procedures are geared toward a sample
9 inspection of design specifications, piping design and
10 stress analysis reports, and pipe rupture hazard
11 analysis reports.

12 They're found in both of those two
13 procedures, number 20 and 21. 20 was issued back in
14 June of this year. Procedure 21 is ready for issue.
15 It just haven't been issued yet. It's in the process.
16 But we expect it to come out with the next update to
17 the manual, to the inspection manual.

18 As I mentioned, we've engaged the AP1000
19 Design Center Working Group for piping DAC, their
20 piping DAC.

21 We held a public meeting back in May, our
22 first introductory meeting with the working group
23 where we highlighted what our procedures were going to
24 entail. And what they're schedule was for development
25 of their piping design packages.

1 Southern Company expects to have their
2 first piping packages and pipe rupture hazard analysis
3 calculations ready for inspection by mid-2012. And
4 those piping packages will be submitted in a sort of
5 a phase fashion. As the facility is constructed from
6 the ground up, as spaces are released for
7 construction, those piping system packages will be
8 provided for the staff to inspect. And as the
9 facility gets built and those spaces are made
10 available and those piping systems are released for
11 construction, we'll just follow along per the
12 licensee's schedule.

13 All packages are expected to be ready by
14 the second quarter of 2013. That's based on our
15 latest public meeting with the Design Center Working
16 Group back in September.

17 And similar to what we did with South
18 Texas, we're going to tabletop our inspection process
19 with the Design Center Working Group as we get closer
20 to them starting construction.

21 CHAIRMAN BLEY: Tell us a little more what
22 that means. This means more face-to-face interaction
23 with them than you would normally have?

24 MR. FREDETTE: Well we always have, we
25 always have face-to-face interaction with them,

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1 Dennis.

2 But it's a new process. We haven't done
3 it before. We want to tabletop it. And basically
4 that means, sitting around a table, kind of like what
5 we're doing now, with maybe a flow chart. And sort of
6 go through step-by-step, here's how the process would
7 work.

8 They would submit information that's
9 related to resolving their piping DAC. They would put
10 a, they would make it available to the staff for
11 inspection. We would go through our whole inspection
12 process, the procedures that would be used, how the
13 inspectors would address those piping packages, or
14 what have you.

15 And then what the, what the licensee at
16 that point could expect in the way of an inspection
17 report. And what that inspection report really means,
18 in regard to closing out those ITAAC in the future or
19 submitting ITAAC closure documentation.

20 And then the staff review the closure
21 documentation. And then publish a *Federal Register*
22 notice as to that ITAAC being closed.

23 That whole process, basically, soup to
24 nuts, here's how it would work. It's just because
25 it's a process we hadn't used before.

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1 CHAIRMAN BLEY: Okay.

2 MR. FREDETTE: We want to make sure that
3 the licensees understand it. And that we, internally,
4 we sort of run it through its paces. So we're
5 comfortable with what we're going to be doing.

6 CHAIRMAN BLEY: I guess what I was asking
7 is, of course, you have to do all this in any case.
8 But what makes, what are you doing additionally in the
9 tabletop that you wouldn't normally do and that is
10 more discussions and talking through it.

11 MR. FREDETTE: Yes, and talking through
12 it. Yes.

13 CHAIRMAN BLEY: Having more people
14 observing --

15 MR. FREDETTE: And our public meetings are
16 always designed -- because the --

17 CHAIRMAN BLEY: The tabletops are public
18 meetings?

19 MR. BEARDSLEY: Yes.

20 MR. FREDETTE: Yes.

21 CHAIRMAN BLEY: Okay.

22 MR. FREDETTE: Our stakeholders, they have
23 lots of questions about the ITAAC inspection and
24 closure process because it's a process that hasn't
25 been used before.

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1 So as with anything new we try to get the,
2 make sure that we're all in agreement on how the
3 process will work before we try it out.

4 MR. BEARDSLEY: This is a little different
5 from what we did with South Texas.

6 South Texas, we actually conducted an
7 inspection. The idea with a tabletop would be to walk
8 through the inspection process, may look some sample
9 packages, but not the actual packages.

10 And the other benefit of it is, not only
11 when the other COL VC Summer participate so they can
12 observe, but the other COL applicants are going to be,
13 you know, be able to see as well.

14 So as a public meeting, it allows the
15 greater community to see what we're doing, the
16 approach we're taking, and help themselves prepare for
17 these kinds of inspections.

18 We fully expect, based on the feedback
19 we've gotten, that Summer is going to have their
20 packages ready shortly after, excuse me, VC Summer is
21 going to have their packages ready shortly after
22 Southern Energy.

23 So we expect to see, you know, once the
24 COLs are in place, the activity really ramping up.
25 And so we want to get them up to speed and sort of

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1 level the playing field, make sure everyone is on the
2 same page prior to the inspection activity happening.
3 And that's our goal.

4 MR. FREDETTE: And finally, our
5 overarching goal here is, basically, we have limited
6 resources and a limited amount of resources that we
7 can dedicate toward ITAAC inspection. We want to make
8 sure those resources are aligned to the pipe and
9 design schedule. So that we can make optimum use of
10 our inspectors.

11 Okay. That, with regard to piping design
12 and human factors engineering DAC, that basically sets
13 the table for what a lot of our focus has been on over
14 the past couple of years. And that's this digital I&C
15 DAC procedure. The one that Mr. Brown and everyone
16 are looking at.

17 The status of this procedure, much like
18 the pipe rupture has an analysis procedure, it is
19 ready for issue. It just has not been issued yet. It
20 should come out in the next update to the inspection
21 manual.

22 It's a generic procedure. Okay. It's got
23 some built-in flexibility. It enables inspection of
24 any piece part of a digital I&C development process.

25 We can look at the entire process or we

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1 can look at a piece part. As an example, the AP1000
2 has one digital I&C DAC. It's the requirements phase
3 for the component interface module. Terry Jackson
4 talked about it a few minutes ago. That being the
5 only digital I&C DAC for AP1000, that's, this
6 procedure will be geared toward addressing that
7 particular DAC. As well as, the related digital I&C
8 ITAAC that are non-DAC.

9 All that information was provided during
10 licensing. But the ITAAC are there.

11 And they rely on a software digital system
12 development process much like the digital I&C DAC. So
13 we will use this procedure to address those ITAAC
14 also.

15 As I mentioned, it generally mirrors a
16 typical system software life cycle. And it includes
17 guidance for sampling life cycle attributes and design
18 outputs.

19 This procedure is the same procedure that
20 the committee was provided a year ago. Okay. It has
21 been beefed up. In that, before it did not conclude
22 a level of inspection or inspection effort. And it
23 did not include any sampling guidance for the
24 inspector. We put that in. And we've established a,
25 basically, a baseline level of effort that we think

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1 should suffice for us to be able to conduct these
2 inspections.

3 Now since we haven't done it before, and
4 we're always open to lessons learned and incorporating
5 insights as we gather them, we will update the
6 procedure with those lessons learned as they arise.

7 MR. BROWN: Let me, if I could, can I make
8 just an observation relative to the other discussion?
9 I mean, when I go look at the DAC and I look at some
10 of the associated ITAAC that you talked about, you
11 know, one of the ITAACs says, "We'll run a test and
12 you'll see that the reactor, that circuit breakers,
13 the breakers trip. And you know, and the output goes
14 to zero. So the mechanisms will scram the reactor."

15 MR. FREDETTE: Right.

16 MR. BROWN: You know, that's pretty
17 straightforward. That's, but, so you see that and I
18 say, "That's fine." You know, that will be done.
19 That will all fall out. Whether somebody actually
20 looks at that or not, there's going to be a test that
21 actually verifies that somewhere along the line. I
22 don't have any problem with that.

23 But the fundamental difficulty with the
24 digital I&C systems, in terms of ensuring their
25 reliability, is, does the design meet the proclaimed

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1 licensing basis independence, deterministic behavior,
2 redundancy, and defense in depths?

3 And defense in depth. And there's not a
4 single word, in terms of focusing, some of the
5 inspection process on verifying those.

6 All the, those are non-testable. Those
7 are non-testable attributes. They are part inherent
8 in a design as it is developed. You can have a
9 marvelous set of functional diagrams. Okay.

10 And you know, a couple of these projects,
11 it was like sucking blood out of rocks, but we
12 eventually got some representation of a functional
13 diagram that illustrated the point of deterministic,
14 and explaining both their independence, how they were
15 going to achieve it, and their deterministic behavior,
16 how they were going to process the data. And how they
17 were going to achieve their diversity and defense in
18 depth approach. Redundancy is kind of obvious if you
19 got more than one thing. It's not all that hard.

20 But yet, the emphasis is more on picking
21 attributes out of an ITAAC table and sampling and
22 looking at those as opposed to focusing, somewhat,
23 some of that inspection on, did the design actually
24 meet the attributes as shown in the DCD, relative to
25 the independence basis? And how did they achieve

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1 those?

2 Doesn't mean you have to check every
3 piece, every part, every thing. It doesn't mean that.

4 It says, "How do I take the fundamental
5 final design?" To me, that's not a licensing, we
6 already did the licensing basis part.

7 MR. FREDETTE: Mm-hmm.

8 MR. BROWN: They provided a functional, a
9 design that theoretically should meet that.

10 That doesn't mean it will be designed that
11 way and actually executed that way. Vendors make a
12 lot of mistakes. And it requires somebody to go back
13 and look.

14 That is not a giant effort. It is not
15 thousands of man-hours. In fact, you're only, in your
16 man-hour estimates on this entire thing is only 880,
17 I think it was 880 man-hours or 680. I don't know.

18 MR. FREDETTE: 660.

19 MR. BROWN: Okay. 660. 80 man days.
20 Roughly.

21 So that's, and it doesn't take much to go
22 look at a vendor design and verify that. How do you
23 process data? Where is your diversity and defense in
24 depth? How does it interface? Is that interface --

25 MR. FREDETTE: Mr. --

1 MR. BROWN: -- and I don't, I don't see
2 that in there.

3 MR. FREDETTE: Mr. Brown, the procedure
4 doesn't call out specifics of redundancy,
5 independence, diversity, and defense in depth,
6 determinism or simplicity. Okay.

7 However, in the requirements phase,
8 Appendix 2 okay, on the very first page, it gives
9 general guidance for the inspector to basically look
10 at translation of functional and regulatory
11 requirements to the digital I&C system requirements.

12 And system, in this case, meaning software
13 and hardware. Okay. It also looks at defining and
14 document the I&C system hardware and software
15 requirements. Defining, documenting, prioritizing,
16 and integrating the software requirements. Defining
17 and documenting software interface and performance
18 requirements. A requirement safety analysis and
19 requirements verification. Okay.

20 In this paragraph, of the requirements
21 phase of the procedure is where a lot of the elements
22 you just mentioned are basically trying, basically
23 captured. Okay.

24 MR. BROWN: I read those. I don't have
25 any problem with those. Those are nice words.

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1 But they don't focus on the fundamentals
2 that you need to demonstrate reliable safe operation
3 of the system. And that's the four, you know, the
4 four pillars of making this stuff come out reliable.

5 MR. FREDETTE: The expertise that we will
6 have doing, executing this procedure, they are, they
7 have the expertise in those areas. They know to look
8 for those things.

9 MR. BROWN: But why isn't it, is it that
10 hard to direct? This is a generic procedure.

11 MR. FREDETTE: Yes.

12 MR. BROWN: I'm trying to, I'm trying work
13 with you here, Tom. Okay. This is a generic
14 procedure. And those are generic fundamentals of
15 making these systems reliable.

16 MR. FREDETTE: We understand. I
17 understand --

18 MR. BROWN: And they ought to be written
19 down.

20 MR. FREDETTE: I understand that. And the
21 staff understands, the staff that would engaged and
22 using this procedure.

23 And believe me, it will only be staff that
24 are trained and expert in those elements that you just
25 mentioned who would use this procedure. No one else.

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1 MR. BROWN: I'm not going to give up. I
2 am not going to give up.

3 CHAIRMAN BLEY: I would just say, just
4 real quickly, 40 years ago, maybe even 20 years ago,
5 we would have said, "Well they'll have the expertise.
6 We don't need any procedures. They're based on their
7 judgment."

8 MR. FREDETTE: But --

9 CHAIRMAN BLEY: The first time something
10 goes wrong here, and one of these Charlie's pillars
11 isn't there, there's going to be more words on it, in
12 this procedure. But go ahead.

13 MR. FREDETTE: We're well aware of the
14 critical pillars of a, of a robust I&C design.

15 I would ask you to give us a chance to use
16 this procedure. And maybe --

17 MR. BROWN: I'm giving you all the chance.
18 I'm just saying, you have four sentences --

19 MR. SIEBER: You ought to write it down.

20 MR. BROWN: -- to the procedures. And
21 then inspectors, I, you people have talent. I have no
22 question about that. I've gotten good responses,
23 people are providing good technical data.

24 But yet, you know, I've got other
25 inspectors that you're bringing in to do this as well.

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1 And the fundamentals ought to be laid out in front of
2 them.

3 Just like your piping wells ought to be,
4 you know, meet certain standards. For good welding,
5 those are written down.

6 MS. DUDES: You know I, this is Laura
7 Dudes again. You know I think it's a good comment.
8 I don't why we're going to sit here --

9 MR. BROWN: It is --

10 MS. DUDES: -- because he's saying, "Hey
11 write it down. It's a couple of sentences." I think
12 Charlie we're going to take that comment so Tom can
13 move on.

14 Because we're going to spend a lot of time
15 saying, "Yes, we know we have technical experts." But
16 I'm just not looking, seeing a downside to writing a
17 few things about independence and -- so let's take the
18 comment and keep going.

19 MR. FREDETTE: I've got the comment. And
20 I understand perfectly well what Mr. Brown's talking
21 about.

22 MS. DUDES: Okay. Good.

23 MR. BROWN: Thank you, Laura.

24 MS. DUDES: Thank you.

25 MR. STETKAR: Charlie has supporters, by

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1 the way.

2 MR. FREDETTE: Dan, did you want to say
3 something?

4 MR. SANTOS: No.

5 MR. FREDETTE: I appreciate, Mr. Brown, I
6 appreciate your insight. And we will take it to
7 heart.

8 This is this next slide, slide 10, is
9 information that we passed on to the Subcommittee
10 before.

11 But basically, this inspection guidance
12 borrowed from a lot of different sources.

13 The standard review plan lots of IEEE
14 standards, NUREGs, reg guides. And of course, the
15 staff expertise.

16 We put a lot of reliance on the staff
17 expertise because for these types of inspections the
18 expertise we're drawing from is the same expertise
19 that was involved in the technical review of the
20 designs.

21 Our focus is on process. But it's also
22 equally focused on configuration management,
23 independent verification and validation, traceability
24 throughout the life cycle. And that's traceability
25 from requirements through the design, to the coding of

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1 the design, to integration, and finally to testing.
2 And that's both factory acceptance testing and site
3 acceptance testing.

4 The procedure and the level of efforts is
5 designed to be front-loaded. In other words, when we
6 look at planning our requirement phases, we'll tend to
7 put a little initial emphasis on those two phases. It
8 basically it gives us confidence that the licensee in
9 this case, that they're effort is robust, that they're
10 system, that they've accounted for all the
11 requirements, and they have a way to address those
12 requirements.

13 And then as we gain confidence, our
14 inspection effort is designed basically to ramp down
15 in the latter part, the latter stages of the
16 development process.

17 Not to say that we can't beef up
18 inspection effort in other areas if we see problems.

19 Our intent is to conduct inspection for
20 each safety related digital I&C platform at each of
21 the development milestones that are part of the
22 typical life cycle.

23 The key here is we want early and
24 continuous engagement with the licensee. It allows us
25 basically to align our resources for optimum effect.

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1 This is a slide that the Subcommittee has
2 seen before in some form or fashion. But it basically
3 highlights the, our philosophy of early engagement.
4 Here, we would conduct DAC inspection at any one of
5 those milestones, 1 through 5.

6 And note that for a typical time line,
7 this occurs well in advance of when the facility
8 simulator is online. Which means it's well in advance
9 of the 52103G finding and subsequent fuel load.

10 This is conceptual only. Note that the
11 inspection of the planning requirements, or the
12 planning phase, would have been done in this
13 particular case five plus years in advance of fuel
14 load.

15 MR. BEARDSLEY: Yes, I think one of the
16 things that we found through our engagement with the
17 Design Center Working Group is that they're keenly
18 aware of our interest, especially in early inspection.
19 They are working very closely with us to identify
20 those development steps in their life cycle
21 development. And making sure that we, you know, we're
22 all on the same page on the best opportunities to come
23 in and get that early look. To start to use the
24 procedures.

25 So where we talked about table topping the

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1 piping procedure, we're looking at, you know, trying
2 to get out and start the inspection on the digital I&C
3 procedures as soon after the COL is issued as we can.
4 And they understand that. They're fully supportive of
5 that.

6 So I think we're on the right, we're in a
7 really good place to get going once the COLs are
8 issued.

9 MR. FREDETTE: Slide 13. Recent
10 inspection insights. This is the lessons learned that
11 we compiled with our limited engagement with South
12 Texas.

13 We want to make sure that we all achieve
14 a common understanding on interpretation of what the
15 inspections test and analysis, and the acceptance
16 criteria portions of the ITAAC, do indeed say. And
17 that's an agreement or understanding between the
18 staff, between the staff and the licensee.

19 And first and foremost, making sure that
20 whatever product that the licensee puts forth to meet
21 the acceptance criteria, they must align with those
22 acceptance criteria.

23 When we looked at South Texas, the ITAAC
24 that were written 15 years ago for the ABWR design,
25 were in some cases, a little bit convoluted. A little

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1 bit general.

2 MR. STETKAR: A little bit.

3 MR. FREDETTE: Yes. And it took a little
4 bit of effort among the staff to, and South Texas, to
5 basically, understand what is it that that ITAAC was
6 really saying.

7 So it's important to basically come to an
8 understanding now on what those ITAACs say before you
9 actually start the inspection.

10 That point was reinforced during the
11 mandatory hearings for Vogtle and Summer recently.
12 And basically, the, those applicants, who will soon be
13 licensees, acknowledged that it's up to, the staff has
14 the final say so on what those ITAACs say.

15 That point is not lost on us.

16 Dedicated inspection planning is
17 essential. Our planning effort for our one South
18 Texas inspection back in June 2010, I would say, it
19 was a little bit sporadic. Because inspectors,
20 they're busy doing other things sometimes.

21 But what we're going to do is, we're going
22 to try to concentrate our effort in to a dedicated
23 planning cycle or planning phase before we actually
24 start inspection.

25 The engagement of the technical staff has

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1 been invaluable. They provide, basically, a good
2 snapshot for other inspectors as to the selection of
3 inspection attributes that should be looked at.
4 Basically, they help us focus our sample. Or the
5 sample that we're going to look at.

6 Understanding organizational and document
7 hierarchy can streamline the inspection effort. This
8 was something else we found out in South Texas. A lot
9 of times, when inspectors go in to the field, they ask
10 for, or they will try to ask for a pre-brief from the
11 licensee. Basically, to give us an overview of how
12 your documentation is organized, how their staff is
13 organized, how the technical organizations relate to
14 the people that are engaged with the inspection
15 effort.

16 In general, the inspection effort has
17 matched the level of technical review. At South
18 Texas, the inspectors basically concluded that they
19 would have done the same level of review if they had
20 been engaged in technical review of those, of that
21 documentation, as to what they actually did during the
22 inspection.

23 MR. ABDEL-KHALIK: If, we'll go back to
24 the first bullet on this slide.

25 MR. FREDETTE: Yes sir.

1 MR. ABDEL-KHALIK: You said that the,
2 essentially ultimately it's the staff's responsibility
3 to interpret the DAC/ITAAC, in general. How is that
4 interpretation going to be documented?

5 MR. FREDETTE: Well, I guess that would be
6 something we would probably put in an inspection
7 report.

8 But you know, leading up to, leading up to
9 any inspection effort, you know, we will have, we have
10 dialogue with the applicants and the licensee that
11 we're getting ready to inspect. That dialogue is
12 important.

13 I've had a lot of conversations, I had a
14 lot of conversations with the South Texas people as to
15 what those ITAAC actually said. What, specifically
16 what did the acceptance criteria say? What did they
17 have to meet?

18 And if you look at our inspection report,
19 from that inspection, you'll see that a couple of
20 places, you know, they either misinterpreted what they
21 ITAAC acceptance criteria said or they didn't follow
22 through. And we had a couple of open items from that
23 inspection, basically, because they didn't address it.
24 So --

25 MR. ABDEL-KHALIK: But does the process

1 specify the importance of this and the need to
2 document the final interpretation of the ITAAC?

3 MR. FREDETTE: No. That's something that,
4 we didn't take that on. And it's nowhere defined in
5 our process. It's something that basically is done
6 through the inspection planning process. When we --

7 MR. ABDEL-KHALIK: But don't you think
8 this adds great value to what you're doing? Actually
9 defining what it is that you're trying to verify?

10 MR. BEARDSLEY: We do. And I think this
11 is much greater than a DAC question.

12 MR. ABDEL-KHALIK: Yes.

13 MR. BEARDSLEY: Throughout --

14 MR. ABDEL-KHALIK: I recognize that.

15 MR. BEARDSLEY: -- through our ITAAC
16 inspection process, we're going to look at, we're
17 going to look early, as early as we can. At the
18 development pieces that the licensee is doing to build
19 up their case to close the DAC.

20 And as we do that, we're going to look at,
21 as we look at that body of work as they build it up,
22 we will gain understanding of what they believe they
23 have to do to close it.

24 And then, you know, if we believe that
25 that's not correct it will be, as Tom said, that's

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1 going to be documented in the inspection procedures.
2 Or excuse me, inspection reports. All of that body of
3 work.

4 All those inspection reports are going to
5 be available to the closure team when the licensee
6 submits their closure letter. So we will have
7 documented all of the discussions on what those DAC,
8 you know, what they did to build up, to complete the
9 DAC. And how we reviewed that, and the comments, or
10 the feedback we had for them. As part of the process.

11 MR. ABDEL-KHALIK: Okay. Let's just carry
12 this a little further. The implication of the first
13 bullet is that there is room for misinterpretation.
14 Is that correct?

15 MR. FREDETTE: I believe there is for the
16 older, the older designs. The ABWR and, well really,
17 just the ABWR that I'm familiar with.

18 MR. ABDEL-KHALIK: If that is the case,
19 how would a sampling based process capture that or
20 eliminate that?

21 MR. FREDETTE: Well --

22 MS. DUDES: I don't think it will.

23 And I think we need to be clear. There's
24 room for different views on all of our regulations
25 right now between the licensees and the staff for the

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1 existing operating plants as well.

2 So, and when we talk about the
3 interpretation of ITAAC, I'm going to give you a bit
4 of a process answer but that's what I do, OGC, ITAAC
5 is a regulation. So our lawyers are the ones who
6 interpret for the licences.

7 What we're talking about here is some
8 statements that the applicants had made during their
9 hearings that, you know, ultimately as we're
10 proceeding through these inspections, that the staff,
11 through their inspection activity and their findings,
12 are going to have the judgment, by virtue of issuing
13 a finding against an ITAAC related activity, of
14 whether or not they're actually being met.

15 But you know, the sampling process, there
16 is no 100 percent in any one of these processes. So
17 I don't think --

18 MR. BEARDSLEY: I think there is a partial
19 answer to your question. By dividing up the ITAAC in
20 to families, we've associated similar requirements and
21 acceptance criteria. And we, you know, in our
22 prioritization process, we have selected, and at least
23 a minimum of one ,and in most cases multiple, targeted
24 ITAAC in each family.

25 So we will have looked at those types of

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1 ITAAC and looked at the licensee's understanding of
2 the closure criteria for the ITAAC and provide them
3 feedback through inspection.

4 So I think we will have provided feedback
5 on the greater majority of these, you know, of the
6 acceptance criteria to them. They thus, have that as
7 part of the building their case for closing the ITAAC.

8 So while it's sampling, it's intelligent
9 sampling to try and cover the breadth and depth of the
10 ITAAC so that we've given them feedback. And we
11 understand where they're coming.

12 So that there's no surprises when they
13 submit the closure package.

14 MR. FREDETTE: Back to the insights. We
15 have found that engaging the technical staff, those
16 technical staff have basically adapted pretty quickly
17 to the inspection environment. They have, in limited
18 cases, that we've seen so far, they've proved their
19 worth in the field.

20 As an example, Region II recently took our
21 inspection procedure and they replicated it. Put a
22 different number on it. And they're using it for
23 inspection of digital I&C system development for the
24 mixed oxide fuel fabrication facility down south.
25 They've been on a couple of inspections. Looking at

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1 requirements. This is a system used, a process, a
2 control system using the Invensys PLC platform.

3 The second inspection they went on, we had
4 some technical staff join that inspection effort. And
5 the feedback that we got from the inspection team was
6 that those guys were really helpful in the field.

7 So that gives us confidence that, you
8 know, our idea of using technical staff is not way out
9 in left field.

10 MR. BEARDSLEY: And we're also gaining
11 lessons learned from run time on the inspection
12 procedure to go back and look at where we can improve
13 the inspection procedure. So there's dual benefit to
14 that activity.

15 MR. FREDETTE: We found that
16 using a smaller inspection team and giving them more
17 time to do an inspection is basically the optimum
18 approach.

19 In the past, we've had people come out of
20 the woodwork and say, "Hey I want to be part of this
21 inspection team." Well we want to make, we want to be
22 focused. And sometimes having a big team, it's
23 managing a herd of cats a little bit.

24 So we want to, we found that our approach,
25 going forward, is we're going to use smaller teams.

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1 We're going to give them more time. That's one of the
2 lessons learned.

3 We learned form the MOX inspection was
4 that, they had a lot to look at. And they just didn't
5 have enough time to do everything. So they ended up
6 having to go back.

7 MR. BEARDSLEY: And we've also engaged
8 with the AP1000 Design Center Working Group on the, on
9 the, how can we, and we have more work to do in this
10 area, but, how can we gain access to their
11 documentation here at headquarters so we can take the
12 technical experts and not necessarily have them spend
13 a week or two weeks at a site? But have them spend a
14 finite period of time. And then gain access to that
15 documentation prior to, or following, the onsite
16 activity to continue to look at those documents. And
17 make sure we get the right resources there.

18 If we show up and there's something we
19 want to look at and we don't have the right person,
20 that one expert that we think is the right guy, we
21 could then get access to that person at headquarters,
22 have them do that inspection activity. And then feed
23 back in to the inspection report at the end.

24 So we're going make sure we get the right
25 people in place to support the activities.

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1 MR. FREDETTE: For the AP1000 digital I&C
2 DAC, as I mentioned, there's one DAC related ITAAC.
3 It's for the component interface module portion of the
4 protection of the monitoring system. It's the
5 requirements phase is the one DAC that's left.

6 We're going to apply our procedure to that
7 item and to the non-DAC ITAAC, specifically, for the
8 diverse actuation system and the protection monitoring
9 system.

10 As I mentioned, we had our initial public
11 meeting with the AP1000 Design Center Working Group
12 just last week. To look at, basically, their schedule
13 and discuss what our inspection plan should be for
14 2012.

15 And of course, we're going to continue
16 more engagement with the Design Center Working Group
17 as we would with any inspection effort.

18 Our expectations for 2012, we're going to
19 complete the tabletop that we talked about for piping
20 inspection with the AP1000 Design Center Working
21 Group. We're going to commence inspection of their
22 piping packages in mid-2012. We're going to commence
23 inspection of the AP1000 PMS and diverse actuation
24 system ITAAC in, probably in February 2012. Although
25 we might put a little bit of slippage in there. Just

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1 for a little bit of margin. And we expect to complete
2 inspection of their one DAC, for the component
3 interface module, sometime around June of 2012. And
4 of course, we're going to complete those human factors
5 and engineering inspection procedures we talked about
6 earlier.

7 So as you know, our expectation is that
8 we're going to get all of this done probably through
9 the first half of the next calendar year. So that the
10 next time we come and brief the Subcommittee we should
11 have some tangible results to share with you. In the
12 form of our experiences, our lessons learned, actual
13 inspection reports, for what we actually did in the
14 field, et cetera.

15 MR. BEARDSLEY: And we will bring a cart
16 with us.

17 MR. SIEBER: Let me ask this --

18 MR. FREDETTE: Yes Mr. --

19 MR. SIEBER: -- a simple question about
20 piping design. When the piping design is a DAC/ITAAC
21 kind of a thing, is, does the design turn out to be
22 generic templates, I'm going to put a hanger every 15
23 feet or every 30 feet. The size. Or is the design
24 specific calculations for each location and position?

25 MR. FREDETTE: Well, I am not a mechanical

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1 or a piping expert, John.

2 MR. SIEBER: I asked the question because
3 I've done both. And one way is a disaster. And the
4 other way works.

5 MR. FREDETTE: I'm wondering if I can call
6 on someone from the technical staff.

7 Jennifer, could you, could you address Mr.
8 Sieber's question?

9 Mr. Sieber, could you repeat the question
10 for Jennifer?

11 MS. DIXON-HERRITY: Yes, could you please?

12 MR. SIEBER: Yes. My question is, when
13 plants are built, they can be built from a piping
14 standpoint one or two ways.

15 You can design the piping system to, as a
16 single design, where you analyze each hanger to make
17 sure that it's where it's supposed to be, the slugs
18 are correct, and so forth. And you may end up with
19 different size hangers, different kinds of bolts
20 fastening it to the wall. And so forth.

21 And the other way is to say, if I put a
22 hanger every 15 feet or 20 feet, or whatever, that's
23 good enough. And I've analyzed this generic case.
24 And when I install it, I'll use my inspectors to fit
25 in the field, where the hangers go, where the pipes go

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1 and so forth. And I don't have to worry about all
2 these calculations.

3 So you have the choice of two.

4 And my question is, does the staff, in
5 their inspection process, have any direction as to how
6 you would inspect these two different types of design
7 philosophies?

8 MS. DIXON-HERRITY: I think the design
9 philosophy that AP1000 is going with is the second
10 one.

11 They're going through and identifying a
12 standard design for their piping. And once they've
13 completed their standard design we're going to look at
14 that through the DAC process.

15 After --

16 MR. SIEBER: Okay. I personally --

17 MS. DIXON-HERRITY: -- the DAC is reviewed
18 we have other ITAAC in place. As the reconciliation
19 ITAAC where we can look at how they would move if they
20 move the hangers, as you described, how they would be
21 moved and how they reconcile the design. In addition
22 to looking at the fabrication aspects.

23 MR. SIEBER: I've been involved in the
24 construction of a number of plants.

25 And the one plant where we used that

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1 generic approach, we actually went back and did all
2 the seismic calculation and ended up with 706 design
3 modifications. As a result of conflicts and
4 inadequacies. And so, just so you catch it.

5 MS. DIXON-HERRITY: We would have that
6 potential concern, yes.

7 MR. SIEBER: Because somebody is going to
8 have to do some of the --

9 MR. STETKAR: Because they'd have to
10 document any hanger that they move, right?

11 MR. FREDETTE: Correct.

12 MR. BEARDSLEY: That's right.

13 MR. SIEBER: Well but not only that,
14 somebody's got to do the calculation. If the licensee
15 says, "I'm going to use the generic approach. And I
16 don't have to analyze anything." Somebody's got to do
17 some analysis to assure that the generic approach is
18 adequate.

19 MR. ABDEL-KHALIK: If you look at item 12
20 in Section B again of 02.04 of the piping, where it
21 talks about review pipe support design, item 3 of that
22 talks about loads and load combinations. I assume
23 that that is individual pipe support dependent.

24 So how can you do this generically?

25 MR. BEARDSLEY: I think it's, what

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1 Jennifer is saying is, it's the AP1000 design, is
2 going to be, they're going to do the analysis.
3 They're going to do the analysis on what they believe
4 the design to be. And then we're going to do an as-
5 built reconciliation once they're installed at
6 Southern, at Vogtle and at VC Summer.

7 Because the, you know, by the nature of
8 construction, those particular, you know, the
9 particular, you know, techniques and lay out of those
10 plants, although the standard design may not be 100
11 percent the same. So then we would have to go back
12 and do the reconciliation to make sure that any
13 modifications made to that standard design were
14 analyzed for.

15 MS. DIXON-HERRITY: That's the plan.

16 And the ITAAC that's put in place for as-
17 built reconciliation, that was its purpose.

18 And again, we're going to be doing this on
19 a sampling basis. So we're not going to go back and
20 look at every hanger. We're going to go and look for
21 problem areas in the plant where we see, they moved
22 this here. How have the reconciled it? And go back
23 and verify that they've done the calculations and
24 verification appropriately. To show that it is still,
25 in fact, in accordance with ASME code and the

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1 regulations.

2 CHAIRMAN BLEY: So just to help make sure
3 I understood what you guys went through.

4 You -- the inspections will be thorough in
5 confirming that the as-built matches the design. But
6 then we'll dig deeper for those places where they,
7 where it is in a perfect alignment. Is that right?
8 Or it will just be a sample?

9 MR. BEARDSLEY: I think the DAC, we're
10 going to go look at the methodology they used for
11 analyzing the pipe hanger alignment and all the other
12 features associated with the layout of the plant.

13 Then the as-built reconciliation is where
14 we go back and look and see, how did they take the
15 standard design and modify it based on the actual
16 construction activity, we're going to look at that
17 analysis as well. So we're going to look at the
18 analysis of the initial design and make sure that the
19 analysis for pipe hanger placement, and all the other
20 characteristics you spoke of, are done, you know, for
21 the design itself, the generic design.

22 Then the as-built is, we'll return to that
23 same the same area and look at the analysis as the
24 changes were made. So we look at, okay, what changes
25 were made? How do they now analyze those, to make

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1 sure those changes are appropriately, you know,
2 completed and are correct?

3 You know, using the same, we expect the
4 same methodology to be used for both the design and
5 the, you know, the construction activity
6 modifications.

7 MS. DIXON-HERRITY: Yes. The methodology
8 would not change.

9 The DAC is actually verifying that the
10 methodology that we reviewed during the design, the
11 design certification process, that that methodology
12 was followed. If they changed that methodology, we
13 would have the opportunity to review that through
14 licensing.

15 MR. SKILLMAN: This is Dick Skillman. I'd
16 like to ask a question exactly to this point.

17 MR. FREDETTE: Yes sir.

18 MR. SKILLMAN: What inspections will the
19 NRC do of the configuration management and
20 configuration control systems of the licensee to
21 ensure that in each one of the cases where there's
22 something different from the standard design to the
23 as-built, is accounted for? What is your, what is
24 your view?

25 MR. FREDETTE: This --

1 MR. SKILLMAN: What is your process for
2 configuration management and configuration control?

3 MR. FREDETTE: It's part of, it's part of
4 design control that we look at. Which is really an
5 aspect of any inspection that we, any field inspection
6 that we look at that's in the area of design.

7 And we go back and we look at, to make
8 sure quality assurance processes are being followed at
9 all times for safety related structure system
10 components. And design control being a key criteria
11 of the Appendix B process. When we look at changes
12 that are made in the field, we look at how those
13 changes are controlled.

14 When we talk about reconciliation,
15 reconciliation means a lot more than just making sure
16 that the as-built meets the previously reviewed
17 design. And meets the ASME code.

18 Reconciliation, in my mind as an
19 inspector, means looking at okay, how did they, what,
20 how did they incorporate their quality assurance
21 processes in to what they did? Be that design
22 control, configuration management, procurement, test
23 controls, the whole gamut of criteria that are
24 provided in Appendix B.

25 For construction field activities, design

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1 control is the key one. Because we, as Jim said, you
2 know, ultimately what you want is, you want to make
3 sure that the whatever was built meets the ASME code
4 and meets the approved, the previously approved
5 design. And if they didn't, if they changed their
6 methodology, did they provide a license amendment to
7 basically change that methodology?

8 And then we would use that as a hook to go
9 back in and look. Did you, did your new methodology
10 capture all these quality assurance processes?

11 MR. BEARDSLEY: Well I think it's a two
12 phase process.

13 We talked just a minute ago about sampling
14 the design. And looking at how they analyze for the,
15 you know, the various, you know, characteristics of
16 the designs.

17 And then we're going to do a sampling of
18 the as-built.

19 So that's, so those are finite pieces to
20 verify that the samples would give you, would
21 characterize the process they used for all of them.

22 In addition, as Tom pointed out, we're
23 going to look at their quality assurance process
24 overall. And make sure the quality assurance
25 processes are meeting Appendix B. That they are

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1 repeatable.

2 And we're going to, they'll be some
3 sampling associated with that as well. So you know,
4 when you take a sample and you say. "Okay, we
5 understand what you did. We believe you met the
6 requirements as specified." As long as, if your
7 quality assurance process is in place, that gives us
8 assurance that they're going to continue to use those
9 same processes and methodologies throughout all the
10 analysis.

11 So that's really the answer, I think. To
12 your question.

13 Because we're not going to look at every
14 one we're going to look at a sample. And then we're
15 going to look at the processes that control that
16 sample.

17 MR. SKILLMAN: Thank you. Let me explore
18 it just a little bit more, if I may please.

19 What you have done is given a strong
20 defense of Appendix B of 10CFR50. I'm asking a
21 different question.

22 MR. FREDETTE: Okay.

23 MR. SKILLMAN: From a live core plant
24 background, how are you guys going to make sure the
25 configuration control program is robust? Because

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1 that's what you are hanging your hat on to keep track
2 of all this stuff.

3 Clearly, you can put it in that's criteria
4 14, in Appendix B, criteria 3 design control.

5 But I'm not talking about Appendix B. I'm
6 talking about that other program known as
7 "configuration control configuration management".
8 What we make sure that what the DAC communicates what
9 the IST shows us what the results are, are what we
10 want them to be. How do we control that? How do you
11 know the configuration control program is robust
12 enough to capture that stuff? That's my question.
13 Program inspection on configuration control?

14 MR. BEARDSLEY: I --

15 MR. SKILLMAN: Program inspection on
16 configuration management?

17 MR. BEARDSLEY: The program inspections
18 that cover configuration control and program
19 management come under the auspices of our quality
20 assurance inspections.

21 So when we, we have taken a myriad of
22 quality assurance related inspections that were used
23 under Part 50 and we've combined them all in to a
24 single inspection procedure, I mean, that gives us a
25 broad spectrum of quality assurance processes to look

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1 at.

2 I think the answer to your question is,
3 that's included in the scope of that inspection. And
4 we look at various phases of that inspection
5 throughout the year. And it's scheduled such that
6 we're going to touch in to all those various areas on
7 an annual or biannual basis depending on the, you know
8 that characteristic we're going to look at.

9 MR. SKILLMAN: Maybe we'll talk about it
10 later. Thank you.

11 MR. BEARDSLEY: Yes.

12 MR. SKILLMAN: Thank you.

13 MR. FREDETTE: It is a tough one.

14 CHAIRMAN BLEY: Charlie, can you --

15 MR. BROWN: Sure.

16 Just an information question in a way.
17 There's two items on here.

18 One that says, "We're going to commence
19 inspection of the AP1000 PMS ITAAC in February of next
20 year." That's about four months from now. Something,
21 three or four months.

22 I went back and looked at some of the
23 ITAAC for that. And they are very equipment specific.

24 In other words, you'll put, verify that
25 two out of three things don't cause an alarm or that

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1 two out of four will do such and such and/or whatever.
2 In other words, the hardware has to, and the
3 procedure, the description says, "There is a test of
4 the equipment." Is the equipment designed now for
5 Vogtle?

6 MR. FREDETTE: Mr. Brown, when I said that
7 we would commence inspection of the AP1000 PMS and
8 diverse actuation system ITAAC, there are a couple of
9 specific ITAAC that I am talking about there.

10 I, this is a general statement but it's
11 really related to two very specific ITAAC. And those
12 are the ITAAC that have to do with development of the
13 PMS system and the development of the diverse
14 actuation system.

15 They're not related to any of the
16 performance ITAAC that you are talking about.

17 MR. BROWN: Okay. I was --

18 MR. FREDETTE: Okay.

19 MR. BROWN: I did not -- I am not
20 recalling --

21 MR. FREDETTE: Yes. There are --

22 MR. BROWN: -- in here talks, the table
23 you gave, the line diagram, it talks about a DAC
24 inspection strategy where there's a series of items
25 from planning requirements --

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1 MR. FREDETTE: Right.

2 MR. BROWN: -- design and implementation,
3 et cetera. And I didn't see anything. So you're just
4 telling me, or is there is a similar one line diagram
5 like this for ITAAC? I mean --

6 MR. FREDETTE: No. If you look at the
7 latter part of that time line, it reflects ITAAC
8 inspection.

9 MR. BROWN: Yes. I mean, it's way out at
10 the end --

11 MR. FREDETTE: Yes.

12 MR. BROWN: -- when you got hardware. And
13 which I understand. I'm not --

14 MR. FREDETTE: True.

15 MR. BROWN: -- questioning that. It's
16 just, that's why I was curious as to what in the world
17 you can do with ether.

18 MR. FREDETTE: That third bullet is
19 addressing some very specific ITAAC in the AP1000
20 design.

21 It's, I can't remember the actual numbers
22 in the ITAAC table. But they are related specifically
23 to protection monitoring system development and
24 diverse actuation development. They're not related to
25 any performance ITAAC.

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1 MR. BROWN: None of the Tier 1 2.5 --

2 MR. FREDETTE: It's 2.5 --

3 MR. BROWN: -- whatever it is.

4 MR. FREDETTE: -- whatever. I think it's
5 number 11 and 12.

6 MR. BROWN: The ones you're looking at?

7 MR. FREDETTE: Yes.

8 MR. BEARDSLEY: I think in general, the,
9 part of the answer is, if you take the ITAAC you
10 quoted that are hardware specific and later on, we're
11 not going to wait to inspect those, you know, piece
12 part test at the end. We're going to conduct a series
13 of inspection as they develop those systems to gain
14 confidence that the systems will be developed in
15 accordance with the, you know, with the requirements.
16 We're going to trace those requirements through.

17 So that if we hang our hats on all the
18 final tests, first of all --

19 MR. BROWN: I understand your point. I'm
20 just saying, there's a set of acceptance criteria.
21 And you're going to be doing whatever the subset is.
22 It's relevant to the time frame that you're going to
23 do the --

24 MR. BEARDSLEY: Correct. Absolutely.

25 MR. BROWN: -- I mean -- okay. So I

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1 understand that.

2 Does the same thing apply to the component
3 interface module DAC which is another -- that's the
4 only DAC in here. That's item 14.

5 MR. BEARDSLEY: Yes. It's one discreet
6 DAC item. It's number 14 in your table there.

7 MR. BROWN: And, so is that a similar
8 phase --

9 MR. BEARDSLEY: Yes.

10 MR. BROWN: -- fits in to the schedule.
11 So, okay, I'll stop on --

12 MR. BEARDSLEY: It's our first look at
13 that particular DAC.

14 MR. BROWN: Okay. Thank you.

15 CHAIRMAN BLEY: Okay. A little while ago
16 you mentioned that this got a bit of a trial down at
17 the MOX review.

18 I take it that wasn't done quite in this
19 tabletop mode. They just tried it out down there? Or
20 can you tell us a little more about that? Was there
21 anything either particularly good or troublesome that
22 cropped up?

23 MR. FREDETTE: Well the inspection process
24 is still ongoing, Dennis.

25 CHAIRMAN BLEY: Mm-hmm.

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1 MR. FREDETTE: So you know, early
2 indications are that, you know, they're sort of
3 getting their feet wet, using --

4 CHAIRMAN BLEY: Okay.

5 MR. BEARDSLEY: -- procedure.

6 They've got a series of other inspections
7 planned for that same, looking at the same thing. Not
8 so much at the MOX facility but they're actually going
9 to go to the vendor. Which is in South California.
10 And they're going to continue inspections, my
11 understanding is, through the holidays and in to
12 January of 2012.

13 I don't have a lot of details.

14 CHAIRMAN BLEY: Okay. So you're not
15 following this as a real trial?

16 MR. FREDETTE: No.

17 CHAIRMAN BLEY: But maybe you'll get
18 something back from it.

19 MR. FREDETTE: Where I can get lessons
20 learned, I'm going to get them.

21 CHAIRMAN BLEY: Excellent.

22 You have more. You have more to go
23 through.

24 MR. FREDETTE: This is my last slide. And
25 this is basically a conclusion slide.

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1 I just want to emphasize for the
2 Subcommittee that we're prepared now to do any piping
3 or digital I&C inspection. Okay. We have procedures.
4 We have a process. And we have the experts. We can
5 address DAC inspection for all disciplines. We don't
6 have procedures for human factors but we do have the
7 expertise.

8 Our process is designed to basically bring
9 the best technical rigor, the best breadth and depth
10 of expertise that we have in-house. When I say "in-
11 house", I mean here at headquarters, and in the
12 regions, basically to bear.

13 The process is flexible. And it's
14 adaptable. In other words, we gather lessons learned
15 all the time. And where they are helpful to our
16 process, we're going to incorporate them.

17 And finally, we're confident that our
18 process will enable the staff to verify that the
19 design implementation conforms to the licensing basis.
20 That's our overarching objective here.

21 CHAIRMAN BLEY: Okay. Thank you.

22 MR. BROWN: I'll reiterate my final point.
23 To do that, you need to make sure under the design
24 implementation conforms to the licensing basis that it
25 meets, aside from all the little fallout underneath,

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1 that the main fundamentals needs to be emphasized.
2 And again, I would encourage that to be cranked in to
3 both the introduction part as well as the hardware
4 software architecture --

5 MR. FREDETTE: Yes sir.

6 MR. BROWN: -- part. I think that's
7 Appendix A3 or something like that. Whatever,
8 wherever the appropriate appendix.

9 MR. FREDETTE: It was --

10 MR. BROWN: As well as the introduction.
11 Because that's the key to all of this --

12 MR. FREDETTE: It's Appendix 2. We'll
13 make sure that it's put in there.

14 MR. BROWN: Okay.

15 CHAIRMAN BLEY: Okay. Well we may --

16 MR. FREDETTE: Thank you for that insight.

17 CHAIRMAN BLEY: -- we knew this would be
18 a short meeting. We appreciate you coming to bring us
19 up to speed.

20 Before I go around the table, are there
21 any more questions from committee members of anything
22 you would like to pursue at this point?

23 (No response.)

24 I think they're really waiting for this.

25 I think I'll take a minute to go around

1 and see if anybody has final comments.

2 Sam?

3 MR. ARMIJO: No, no comments.

4 CHAIRMAN BLEY: All right.

5 MR. ABDEL-KHALIK: No, thank you.

6 CHAIRMAN BLEY: Charlie.

7 MR. BROWN: I said my piece.

8 CHAIRMAN BLEY: Indeed.

9 Jack.

10 MR. SIEBER: I guess then I end up with
11 two concerns.

12 Both of which is the, how the basic design
13 is developed and whether, and how it's implemented.
14 And what's that interface? I think that's one of the
15 key issues. And that appears both in the piping area
16 and also in the digital I&C.

17 And I think that in the, as part of the
18 focus of the inspection process and DAC verification,
19 implementation verification, that you need to put
20 effort in to determining what the design criteria
21 really is from the design acceptance criteria, whether
22 that's the appropriate criteria. And even though
23 there's not much you can do about it once your design
24 is certified. And the details of how that's
25 implemented.

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1 In I&C for example, it's not only
2 important to understand the building block kind of
3 schematic but also what individual pieces do and where
4 all the wires go to determine whether you meet all the
5 overriding design criteria.

6 From the standpoint of piping, I have done
7 piping designs and installations using both methods
8 which one of which is the generic method. The other
9 one is specific calculations for not only seismic but
10 load carrying capability, expansion and contraction,
11 movement during operation and so forth.

12 And I've learned through experience that
13 when you apply generic methods, I suspect and I would
14 predict, that they're going to be some places where
15 the generic method does not meet the requirements.

16 And right now, I'm not sure when I think
17 about it, whether there is a way to catch these
18 individual instances where hangers not positioned
19 correctly or the load is different than what the
20 generic assumptions applied, without doing an analysis
21 of the whole thing.

22 But I would be, I would be cautious about
23 using generic criteria for the fitting of pipe
24 hangers, component support, and so forth.

25 And I've seen failures in my career. I

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1 have seen analyses that put up warning signs before a
2 failure occurred which required lots of modifications.

3 And so, those would be my two areas of
4 concern.

5 CHAIRMAN BLEY: Thanks. Just --

6 MR. SIEBER: I'm not sure -- you see the
7 problem is, I can't define, with a bunch of generic
8 inspection procedures, how much of that comes out of
9 the inspector's head. And you know, there's all kinds
10 of inspectors, from the very best to the adequate.

11 And, so I would not want the inspection
12 quality to be spread across a large spectrum.

13 Thank you.

14 CHAIRMAN BLEY: John.

15 MR. STETKAR: Yes, I think, I'm still, you
16 know, obviously interested in seeing how the digital
17 I&C inspection process kind of plays out.

18 I think, in some sense, you're fortunate
19 that you're getting your feet wet on AP1000. Where
20 you have a, sort of a fairly focused and perhaps a bit
21 more reasonably well defined scope of what you're
22 looking at compared to some of the other design
23 centers.

24 I think reading through the process,
25 reading through, you know, what we have, there are a

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1 lot of opportunities for the inspectors to really dig
2 in, you know, and develop the kind of confidence I
3 think that you hear us sort of asking for.

4 And all I'll say is that, you know, I'm
5 pretty interested in sort of following through to see
6 how you do, not only on Vogtle and Summer, which may
7 be, you know, a good starting experience, but I'd be
8 really interested in Fermi, for example. Which is,
9 you know, still on track and coming down the road at
10 some time. And that tends to be a little bit more
11 diffuse, I think.

12 So I, you know, how you sort of implement
13 this experience in form sampling process, if I can
14 characterize it that way, I think we're all pretty
15 interested to see how that's, how that's going to play
16 out.

17 CHAIRMAN BLEY: Thank you.

18 And I guess that's, I'm kind of close to
19 where John is.

20 This whole process worries me, probably
21 everyone, in that, in that the real glitches in
22 designs come at the detailed level. And the details
23 coming at an awkward place to find them.

24 I'm gaining confidence, I think, in the
25 expertise that's going to be applied in this first

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1 round of inspections. And look forward to seeing some
2 of the results and hearing how deeply these issues
3 were engaged.

4 I worry that some time later the use of
5 the procedures and associated guidance will become a
6 little more legalistic. And people will drop back to
7 the minimal, this is exactly what I have to do and
8 nothing more.

9 And I think before we get all the way
10 through this one time process, it's going to be
11 important to document a little more carefully what it
12 takes to build the right team to do this well. And
13 have that written down, so that five or ten years from
14 now, it's still there. Because those sorts of things
15 do get, they drift away.

16 Christina, I'd like us to keep informed of
17 when the public meetings are. And maybe we can follow
18 those in the future. Because I think we'd learn a lot
19 from that.

20 In any case, thanks very much to the staff
21 for their discussion, their presentation, and for
22 keeping us up to date. If there's nothing more, we'll
23 call this meeting closed.

24 (Whereupon, the above-entitled
25 matter was concluded at 10:16 a.m.)

ATTACHMENT 65001.21

INSPECTION OF PIPE RUPTURE HAZARDS ANALYSES (INSIDE AND OUTSIDE CONTAINMENT) DESIGN ACCEPTANCE CRITERIA (DAC)-RELATED ITAAC

PROGRAM APPLICABILITY: 2503

65001.21-01 INSPECTION OBJECTIVES

01.01 To verify that the pipe break hazard analysis report, as defined in the Design Certification Document (DCD) was completed in accordance with the methodology called out in the DCD, and any additional requirements provided in license conditions in the COL FSAR.

01.02 To determine whether licensee records establish an adequate basis for the acceptance for closure of Inspection, Test, Analysis and Acceptance Criteria (ITAAC) for the as-designed pipe rupture hazards analysis report.

65001.21-02 INSPECTION REQUIREMENTS AND GUIDANCE

Background: Design Acceptance Criteria (DAC) are a set of prescribed limits, parameters, procedures, and attributes upon which the NRC relies, in a limited number of technical areas, in making a final safety determination to support a design certification. DAC is to be objective (measurable, testable, or subject to analysis using pre-approved methods), and must be verified as a part of the ITAAC performed to demonstrate that the as-built facility conforms to the certified design (SECY 92-053).

There are three process options for DAC/ITAAC resolution:

- Resolve during the design certification or amendment to the design certification
- Resolve as part of COL review
- Resolve after COL is issued

In the first two options, the applicant will submit the design information and the NRC will document its review in a safety evaluation. In the third option, the COL holder notifies the NRC of availability of design information and the staff will document its review in an inspection report.

Should the third option be implemented for a first standard plant design, subsequent COL applicants may reference the first standard plant closure documentation and close the DAC/ITAAC under the concept of "one issue, one review, one position," identified in NRC guidance.

Description of the Pipe Rupture Hazards Analysis Report ITAAC: The as designed pipe rupture hazards analysis report ITAAC is a set of methodology and criteria pertaining to protection of essential systems or components inside and outside containment from the adverse effects of postulated failures in high and moderate energy piping (HELB and MELB). However, this ITAAC cannot be completed until after the piping design has been completed and the piping DAC has been met. After the plant is built, the as built pipe rupture hazards analysis report ITAAC will verify that the as designed pipe rupture hazards analysis inside and outside containment is still valid.

02.01 Inspection Plan/Scoping.

The scope of piping Pipe Rupture Hazards Analysis Report ITAAC encompasses all high-energy and moderate-energy fluid systems in the proximity of essential systems, structures, and components (SSCs) inside and outside containment.

The design commitment is as follows: “Systems, structures and components (SSCs) that are required to be functional during and following a design basis event shall be protected against, or qualified to withstand, the dynamic and environmental effects associated with analyses of postulated failures in high and moderate energy piping.”

02.02 Design Inspections. The following tasks should be performed across a representative sample of high and moderate energy piping systems:

- a) Review the As-Designed Pipe Rupture Hazards Analysis Report to verify that each space containing structures, systems, and components (SSCs) important to safety is addressed.
- b) Review the As-Designed Pipe Rupture Hazards Analysis Report to verify for each chosen piping segment that the methodology called out for determination of postulated pipe break and crack types and locations in the license is followed. Aspects that should be verified include:
 - Criteria for determining the pipe breaks/cracks location including their associated pipe stress and cumulative usage factor
 - Criteria for determining the pipe break types and crack sizes
 - Computer codes used in analyses are approved for use in the DCD/license
- c) Review the As-Designed Pipe Rupture Hazards Analysis Report to ensure the methodology called out for the evaluation of dynamic effects and environmental effects of postulated pipe breaks/cracks in the license is followed. Aspects that should be verified include:

- Criteria for determining the jet expansion modeling and the jet impingement force
 - Design of the mitigation features (i.e., pipe whip restraints and jet impingement barriers)
 - Design of the SSCs for which mitigation features are not provided.
 - Criteria for the protection of flooding and other adverse environmental effects
- d) Review the As-Designed Pipe Rupture Hazards Analysis Report to verify that SSCs which are identified to be the potential targets will be protected as required in the license by the associated mitigation features as-designed. This includes the review of the sketches of applicable high energy piping systems showing the location, size and orientation of postulated pipe breaks and the location of pipe whip restraints, jet impingement barriers, and the SSCs important to safety which are in close proximity to the postulated pipe rupture locations. It also includes review of the isolation and separation provided in the plant design. The level of review should be guided by inspector experience, risk significance of the SSCs, operating experience in determining the design of physical protection provided to the SSCs important to safety.
- e) Review the As-Designed Pipe Rupture Hazards Analysis Report to verify the report addresses all of the information required in the license.

Guidance: The inspection should involve a review of the pipe rupture hazard analysis report to verify those aspects required to be covered in the DCD are fully addressed in accordance with the methodology described in the DCD. Inspectors should be prepared to refer to the acceptance criteria defined in Sections 3.6.1 and 3.6.2 of NUREG-0800 during the reviews of the As-Designed Pipe Rupture Hazards Analysis Report.

Branch Technical Position (BTP) 3-4 in the SRP would be a good reference for this review. This could include, but may not be limited to:

- Review the pipe break locations in high energy piping to verify that the DCD methodology was followed to identify the locations and that no locations were missed;
- Review through-wall crack locations in high and moderate energy piping to verify that the DCD methodology was followed to identify the locations and that no locations were missed;
- Review essential structures, systems, and components to ensure that all were addressed in the report;
- Review evaluation of consequences of pipe whip and jet impingement (for rooms with both high energy breaks and essential items, confirm that there is no adverse interaction between the essential items and the whipping pipe or jet and that the plant layout is modified as required to provide separation to protect

essential systems); evaluate consequences of flooding, environment, and compartment pressurization;

- Evaluate consequences of flooding, environment, and compartment pressurization in the break exclusion zones in the vicinity of containment penetrations due to 1.0 square foot breaks in the main steam and feedwater lines evaluate the design and location of protective hardware;
- Review isometric piping sketches that identify the break locations, the basis for these locations and the protective hardware which mitigates the consequences of these breaks;

The system selection criteria for inspection should consider risk significance, operating experience, new design, complexity of system transients, and safety significance of the essential SSCs. As a minimum, the pipe rupture hazard analysis report should be completed prior to beginning the inspection. If not completed, the report portions applicable to the spaces the licensee claims are ready for review should be complete. The inspectors should review the design-appropriate "Risk Insights" document during selection of essential SSCs. (e.g., Risk Insights for the Review of the AP1000 Design, Rev 1.)

Inspection Sample Guidance: The Pipe Rupture Hazards Analysis Report ITAAC inspection should verify at least 10 to 15 isolation and/or physical protection mechanisms with different characteristics.

During the preparations for the inspection, the team should select a sample of 15 to 20 piping HELB and MELB design packages and identify those packages to the licensee and piping design contractor/vendor. The final sample selection of 10 to 15 packages for review will be done when the team arrives at the location of the inspection. For the purpose of this inspection, a design package is defined as all of the design information involved with a particular HELB or MELB location, and the isolation and/or physical protection mechanisms associated with that particular location.

02.03 As-Built Inspections: Once construction and the reconciliation of the pipe rupture hazard analysis are complete, inspection for this ITAAC can commence. On a sampling basis, review systems in the field after they are constructed to observe the protective hardware installed to mitigate consequences of pipe breaks and verify that they were installed in accordance with the design and the reconciliation analysis. Confirm by walk down that a sample of installed piping configuration and support hardware is installed per the piping design and piping ISOs.

Review the pipe rupture hazard analysis report to determine where the report was reconciled for changes made to the plant with regard to placement of mitigation features such as pipe whip restraints, jet impingement barriers, drainage systems, and physical separation of piping, equipment, and instrumentation, etc. Verify that the changes were done in accordance with the methodology called out in the DCD and the COL FSAR.

The guidance above can be followed in verifying that the changes were handled in accordance with the regulations and license.

65001.21-03 RESOURCE ESTIMATE

The estimated hours for completing the piping DAC inspection are 210 to 280 staff hours based on a two weeks audit/inspection by three or four NRC staff members. In addition, the estimated hours for preparation and documentation are 70 hours and 120 hours respectively. Additional hours may be required if the inspection is performed in parts.

65001.21-04 REFERENCES

ASME B&PV Code Section III, Applicable Revision

Facility Final Safety Analysis Report (FSAR) and Design Certification Document (DCD)

Facility Final Safety Evaluation Report (SER)

10 CFR 50, Appendix A, General Design Criterion 4 – Environmental and Dynamic Effects Design Bases

NUREG-0800, Standard Review Plan (SRP) for the Review of Safety Analysis Reports for Nuclear Power Plants, Section 3.6.1 “Plant Design for Protection Against Postulated Piping Failures in Fluid Systems Outside Containment”

NUREG-0800, Standard Review Plan (SRP) for the Review of Safety Analysis Reports for Nuclear Power Plants, Section 3.6.2 “Determination of Rupture Locations and Dynamic Effects Associated with the Postulated Rupture of Piping”

NRC Branch Technical Position 3-3, "Protection Against Postulated Piping Failures in Fluid Systems Outside Containment."

NRC Branch Technical Position 3-4, "Postulated Rupture Locations in Fluid System Piping Inside and Outside Containment."

END

ATTACHMENT 65001.20

INSPECTION OF SAFETY-RELATED PIPING DESIGN ACCEPTANCE CRITERIA (DAC)-RELATED ITAAC

PROGRAM APPLICABILITY: 2503

65001.20-01 INSPECTION OBJECTIVES

01.01 To verify the piping design was completed in accordance with the piping Design Acceptance Criteria (DAC) and the methodology in the Design Control Document (DCD), the ASME Code Section III requirements, and any additional requirements provided in license conditions in the COL.

01.02 To determine whether licensee records establish an adequate basis for the acceptance for closure of Inspection, Test, Analysis and Acceptance Criteria (ITAAC) for piping DAC.

65001.20 -02 INSPECTION REQUIREMENTS AND GUIDANCE

02.01 Background: Design Acceptance Criteria (DAC) are a set of prescribed limits, parameters, procedures, and attributes upon which the NRC relies, in a limited number of technical areas, in making a final safety determination to support a design certification. DAC is to be objective (measurable, testable, or subject to analysis using pre-approved methods), and must be verified as a part of the ITAAC performed to demonstrate that the as-built facility conforms to the certified design (SECY 92-053).

There are three process options for DAC/ITAAC resolution:

- a. Resolve during the design certification or amendment to the design certification
- b. Resolve as part of COL review
- c. Resolve after COL is issued

In the first two options, the applicant will submit the design information and the NRC will document its review in a safety evaluation. In the third option, the COL holder notifies the NRC of availability of design information and the staff will document its review in an inspection report.

Should the third option be implemented for a first standard plant design, subsequent COL applicants may reference the first standard plant closure documentation and close the DAC/ITAAC under the concept of "one issue, one review, one position," identified in NRC guidance. The staff may elect to confirm that the basis (documentation) for DAC/ITAAC closure from a first standard design to subsequent COL applicants is consistent. Documentation and results of DAC/ITAAC inspection will be archived in the Construction Inspection Program Information Management System (CIPIMS).

02.02 Description of Piping DAC. Piping DAC is a set of methodology and criteria pertaining to piping design documented in the DCD upon which the NRC staff relies in making a final safety determination regarding the piping design requirement to support a design certification in lieu of reviewing the piping design. DAC represent a set of design commitments which are to be verified as part of the Inspections, Tests, Analyses and Acceptance Criteria (ITAAC) once the design is complete.

In every design to date, the applicant chose to delay completing the piping design until later in the construction period. Separate ITAAC are included for verification that the design meets the regulations and for verification that the plant was built in accordance with the design. To date, applicants have elected to resolve the piping DAC as part of the COL review or after the COL is issued, not as part of the design certification.

02.03 Inspection Plan/Scoping. Although the scope of piping DAC encompasses all safety-related ASME Class 1, 2, and 3 piping system, the system selection for inspection should consider risk significance, operating experience, new design, complexity of system transients, and safety significance of the piping systems. As a minimum, all risk significant piping packages should be completed to the point where the Design Specifications and Reports are certified prior to beginning the inspection.

For example, AP1000, Rev. 18, Table 3.9-20, "PIPING PACKAGES CHOSEN TO DEMONSTRATE PIPING DESIGN FOR PIPING DAC CLOSURE (in addition to Class 1 lines larger than 1 inch in diameter)" provides a list of piping packages which should be completed prior to the beginning of the inspection.

Similar lists can be established for other standard designs, as needed, where the piping DAC is to be resolved after issuance of the COL. This list was prepared for AP1000 because of the status of the design when the applicant attempted to address the piping DAC during the design certification amendment. If this approach is to be taken, it should be negotiated prior to the inspection. The licensee should provide their list of risk significant piping and the inspection team leader should review and request the addition of other piping that they feel should be included based on risk. All of the design for piping on the list should be complete (Design Reports certified) prior to the team arriving on site.

There is a possibility that some of the piping design work may be sub-contracted to different design companies/agencies for completion. During early preparation for a piping DAC inspection, the team leader should obtain information about the involved design resources from the licensee and the design agency. Effort should be made to select at least one to two samples from each sub-contracted design company. To expedite the inspection process, it may be beneficial to request that representatives of all parties involved and the necessary documentation be present at one location to support one inspection.

It is recognized that piping design packages will likely be changed as the plant is built. These changes are required to be reconciled by the ASME Code and will be inspected

as part of a separate ITAAC or set of system based ITAAC at each site that will specifically look at reconciliation of the as-built design.

02.04 Design Inspections. The following tasks should be performed across a sample of ASME design specifications and design reports:

- a. Review the piping Design Specifications for each chosen piping segment to verify that it uses the design inputs specified in the DCD or required in ASME Code. Aspects that should be verified include:
 1. Code and Code Cases
 2. Requirements, including materials, manufacturing, testing & examination, and quality assurance
 3. Design Input (e.g., structure)
 4. Design Input including temperature and pressure
 5. Load Condition including seismic, accident, thermal, dead weight
 6. Other Conditions (e.g., design life)
- b. Review the Design Reports/Stress Reports to verify that the resulting design meets the Design Specification and that the design was developed using the methodology called out in the DCD and the ASME Code. The calculations and/or analysis for the following should be reviewed as necessary to make this verification. The level of review should be guided by inspector experience, risk significance of the piping, and operating experience in determining the analysis to verify.
 1. Review piping analysis input (references: Line list or P&ID, etc.)
 - (a) Pipe size
 - (b) Schedule/Wall thickness
 - (c) Insulation weight
 - (d) Material
 - (e) Design pressure
 - (f) Design temperature
 2. Review support input
 - (a) Support Stiffness
 - (b) Snubber/Spring
 3. Review the modeling of additional masses due to weight from support members/snubbers/springs and branch piping.
 4. Review the licensee's assumption and open items (e.g., valve weight) in the design report

5. Ensure that Computer Codes used in completing the design are listed in Section 3.9.1 of the DCD and have been verified
6. Review piping package model scope
 - (a) Decoupling criteria
 - (b) anchor to (equivalent) anchor
7. Review thermal analysis
 - (a) Thermal modes by referencing P&IDs, system description, etc.
 - (b) Thermal Anchor Movements consideration of displacement from run pipe, supported from steel containment shell, etc.
 - (c) Thermal stratification consideration for Pressurizer surge line, RHR/SIS (DCD, Bulletins 88-08 and 88-11, EPRI Report TR-103581, EPRI Report TR-1011955). Stratification monitoring data will be used to verify surge line design analysis.
8. Review seismic analysis
 - (a) Damping value, response spectra/time history input
 - (b) Response spectra input (amplified response spectra for non-rigid equipment, piping)
 - (c) Individual support motion (ISM) method support groups & modal combination method
 - (d) Modal combination method for uniform support motion (USM) (RG 1.92)
 - (e) Seismic anchor movement (SAM) consideration
 - (f) Combination of inertia & SAM
9. Review dynamic analysis considerations: valve open/closure events (MSIV, SRV, TSV) by referencing P&IDs, system description, etc.
10. Review building settlement case: piping support movement consideration for inter-building piping
11. Review fatigue evaluation
 - (a) Design transient/cycles
 - (b) Environmental assisted fatigue (EAF) Fen factor (RG 1.207, NUREG/CR-6909) for Code Class 1 piping (Note: RG 1.207 does not apply to AP1000 & ABWR)
 - (c) ASME Code fatigue requirements (NB-3653) for Code Class 1 piping
 - (d) Stress Reduction Factor for Code Class 2 & 3 piping (NC/ND-3600)
12. Review ASME Code stress qualification delineated in NB/NC/ND-3600
 - (a) Stress indices for weld, reducer, elbow, branch, etc.

- (b) Deflection limit specified in design specification
- 13. Review additional stress qualification: Functional Capability of piping system
- 14. Review loading combination for pipe stresses
- c. Review pipe support design
 - 1. Applicable Codes (ASME Code, Section III, Subsection NF)
 - 2. Jurisdictional boundary
 - 3. Loads and load combinations
 - 4. Pipe support base plate and anchor bolt design
 - 5. Use of energy absorbers and limit stops
 - 6. Use of snubbers
 - 7. Pipe support stiffness
 - 8. Seismic self-weight excitation
 - 9. Design of supplementary steel
 - 10. Consideration of friction forces
 - 11. Pipe support gaps and clearances
 - 12. Instrumentation line support criteria
 - 13. Pipe deflection limits

Guidance: All of the tasks may not be applicable for every design package selected for review (e.g., building settlement) and do not need to be verified for every package. A sample of each from several packages and an increased sample where concerns identified would be appropriate. The inspector(s) may find it advantageous to provide/generate a check-list for the attributes listed above for use during the review of each package. (Note, inspection should not be done by checklist or included in the inspection report, although use of a checklist may be a useful inspection tool.)

The AP1000 DCD, Rev 18, Table 3.9-19, CRITICAL PIPING DESIGN METHODS AND CRITERIA (PIPING DESIGN CRITERIA) provides a comprehensive listing of piping design commitments and the associated Tier 2 reference (paragraph or table) for the details of each commitment. This list is attached as an example of the methodologies which could be verified during this inspection. This list is not required and may not be available for every design. It does, however, give a good overview of the methodologies to look for. Whether the methodology applies should be verified in the DCD.

Inspection Sample Guidance: The DAC inspection should verify at least 10 to 15 piping design packages (anchor to anchor or equivalent anchor) with different characteristics described above. In addition to the ASME Code Design Specification and Reports for

the chosen lines, all documents referenced in the specification and report, relevant design analyses, drawings, and calculations should be available for the inspection.

As stated in paragraph 02.01, above, there is a possibility that some of the piping design work may be sub-contracted to different design companies/agencies for completion. During early preparation for the inspection, the team leader should obtain information about the design resources used by the licensee and the design agency. Effort should be made to select at least one to two samples from each sub-contract design company involved with safety-related piping design work.

During the preparations for the inspection, the team should select a sample of 15 to 20 piping packages and identify those packages to the licensee and design agency. The final sample selection of 10 to 15 packages for review will be done when the team arrives at the location of the inspection.

The following list includes AP1000 piping sections that may be of interest for inclusion in the sample due to the more challenging conditions to be addressed or issues known in industry:

- Pressurizer surge line, RHR/SIS (thermal stratification as identified in IE Bulletins 88-08 and 88-11)
- Main steam line (hydro dynamic loading, turbine stop valve closure event)
- Feedwater line (hydro dynamic loading, stratification)
- Pressurizer spray line, safety & relief line (high thermal transient, high fatigue)
- CVCS charging & letdown (thermal fatigue due to charging & letdown flow shut and return to service)
- Reactor coolant loop (safety- significance, Class 1 fatigue evaluation)
- HPSI/LPSI (high thermal transient fatigue)
- Head vent (hydro dynamic loading)
- Passive core cooling system (dynamic transient due to squib valve actuation, new design)

65001.20-03 RESOURCE ESTIMATE

The estimated hours for completing the piping DAC inspection are 210 staff hours based on a two week inspection by three NRC staff members. In addition, the estimated hours for preparation and documentation are 70 hours and 120 hours respectively.

65001.20-04 REFERENCES

ASME B&PV Code Section III, Applicable Revision

Facility Final Safety Analysis Report (FSAR) and Design Certification Document (DCD)

Facility Final Safety Evaluation Report (SER)

EPRI Report TR-103581, "Thermal Stratification, Cycling, and Striping"

EPRI Report TR-1011955, "Management of Thermal Fatigue in Normally Stagnant Non-Isolable Reactor Coolant System Branch Line."

NRC Bulletin 88-08, "Thermal Stresses in Piping Connected to Reactor Coolant Systems."

NRC Bulletin 88-11, "Pressurizer Surge Line Thermal Stratification"

NUREG/CR-6909, "Effect of LWR Coolant Environments on the Fatigue Life of Reactor Materials"

RG 1.207, "Guidelines for Evaluating Fatigue Analyses Incorporating the Life Reduction of Metal Components Due to the Effects of the Light-Water Reactor Environment for New Reactors"

END

Attachment 1
Revision History for 65001.20

Commitment Tracking Number	Issue Date	Description of Change	Training Needed	Training Completion Date	Comment Resolution Accession Number
N/A	ML111100647 06/02/11 CN 11-009	<ol style="list-style-type: none"> 1. Initial issuance to support ITAAC related inspections under 10CFR52. 2. Researched commitments for 4 years and found none. 	None	N/A	N/A

ACRS Backup Slides

**Table 3.8-1
Pipe Rupture Hazards Analysis (Sheet 1 of 1)**

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
<p>Systems, structures, and components (SSCs), that are required to be functional during and following a design basis event shall be protected against or qualified to withstand the dynamic and environmental effects associated with analyses of postulated failures in high and moderate energy piping.</p>	<p>Inspection of the as-designed pipe rupture hazard analysis report will be conducted. The report documents the analyses to determine where protection features are necessary to mitigate the consequence of a pipe break. Pipe break events involving high-energy fluid systems are analyzed for the effects of pipe whip, jet impingement, flooding, room pressurization, and temperature effects. Pipe break events involving moderate-energy fluid systems are analyzed for wetting from spray, flooding, and other environmental effects, as appropriate.</p>	<p>An as-designed pipe rupture hazard analysis report exists and concludes that the analysis performed for high and moderate energy piping confirms the protection of systems, structures, and components required to be functional during and following a design basis event.</p>

**Table 3.8-2
Piping Design (Sheet 1 of 1)**

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
<p>The ASME Code Section III piping is designed in accordance with ASME Code Section III requirements.</p>	<p>Inspection of ASME Code Design Reports (NCA-3550) and required documents will be conducted for the set of lines chosen to demonstrate compliance.</p>	<p>ASME Code Design Report(s) (NCA-3550) (certified, when required by ASME Code) exist and conclude that the design of the piping for lines chosen to demonstrate all aspects of the piping design complies with the requirements of ASME Code Section III.</p>

**Table 2.5.2-8
Inspections, Tests, Analyses, and Acceptance Criteria**

Design Commitment	Inspection, Tests, Analyses	Acceptance Criteria
<p>14. The Component Interface Module (CIM) is developed using a planned design process which provides for specific design documentation and reviews.</p> <p>{Design Acceptance Criteria}</p>	<p>An inspection and or an audit will be performed of the processes used to design the hardware, development software, qualification and testing.</p>	<p>A report exists and concludes that CIM meets the below listed life cycle stages.</p> <p>Life cycle stages:</p> <ul style="list-style-type: none"> a. Design requirements phase, may be referred to as conceptual or project definition phase. b. System definition phase c. Hardware and software development phase, consisting of hardware and software design and implementation d. System integration and test phase e. Installation phase



Presentation to the ACRS

Design Acceptance Criteria

Task Working Group Progress and Status

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November 2, 2011

Objectives

Provide the Committee:

- **Status of DAC Working Group activities, with emphasis on DAC inspection infrastructure, including process and procedures**
- **Overview of staff's approach to Piping and DI&C DAC for the AP1000 design**
- **Insights from limited inspection involvement with the South Texas Project DAC initiative**
- **Overview of activities forecasted for 2012**

Background

- **Task Working Group established 11/09 to develop viable inspection strategy for DAC**
- **Inspection process and procedure development initiated w/ STP for ABWR DI&C DAC**
- **Inspection framework developed/demonstrated at STP; completed one “planning phase” DI&C inspection (6/10)**
- **Briefed ACRS on inspection plans for 2011 (10/10)**
- **Staff committed to periodically brief ACRS on status**
- **STP initiative suspended due to Fukushima event (3/11); focus shifted to DAC procedures for AP1000 COLs**
- **Initial engagement w/ AP1000 DCWG (Piping, DI&C)**
- **Inspection procedures finalized for Piping and DI&C DAC (9/11)**

Process Overview

- **DAC inspection is ITAAC inspection**
- **Incumbent on Applicant/Licensee to perform and complete – Staff verifies through inspection**
- **DAC inspection engages technical staff in supporting RII/CCI**
- **Reliance on applicant/licensee construction and ITAAC schedule**
- **Results documented in Inspection Report; archived to support closure process**

DAC Procedure Overview

- **Piping Design – IP 65001.20**
- **Pipe Rupture Hazards Analysis – IP 65001.21**
- **Digital I&C – IP 65001.22 (6 attachments); generally mirrors typical DI&C life cycle**
- **Human Factors Engineering – IP 65001.23 through IP 65001.26 (specific to HFE process)**

DAC Procedures – Human Factors Engineering

- IP 65001.23 – Integrated System Validation
- IP 65001.24 – Task Support Verification
- IP 65001.25 – Design Verification
- IP 65001.26 – As-Built Configuration Verification
- Address NUREG-0711 (HFE Program Model)
- Plan for multiple attachments to address specifics of each design
- Status: in development; due mid-2012

DAC Procedures - Piping Design/PRHA

- **IP 65001.20/21**
- **Developed from Strategy Document
commissioned by DAC Working Group**
- **Procedures geared toward sampled
inspection of design specs, design/stress
reports and PRHA reports**
- **Status: IP 65001.20 issued 6/11;
IP 65001.21 is RFI 9/11**

AP1000 Piping DAC

- **Public meetings held w/ AP1000 Design-Centered Working Group (DCWG)**
- **RCOL (Southern Co.) expects to have first piping packages and PRHA calculations ready for inspection mid-2012 (phased submittal aligned with Vogtle facility construction)**
- **All packages expected to be ready for inspection by 2Q 2013**
- **Plan to tabletop inspection process w/ AP1000 DCWG**
- **Goal: align inspection resources to piping design schedule**

DAC Procedure - Digital I&C

- **IP 65001.22 w/ attachments**
- **Status: RFI 9/11**
- **Generic procedure; built-in flexibility enables use for inspection of any DI&C development process**
- **Generally mirrors typical DI&C system/software life cycle**
- **Includes guidance for sampling life cycle attributes and design outputs**

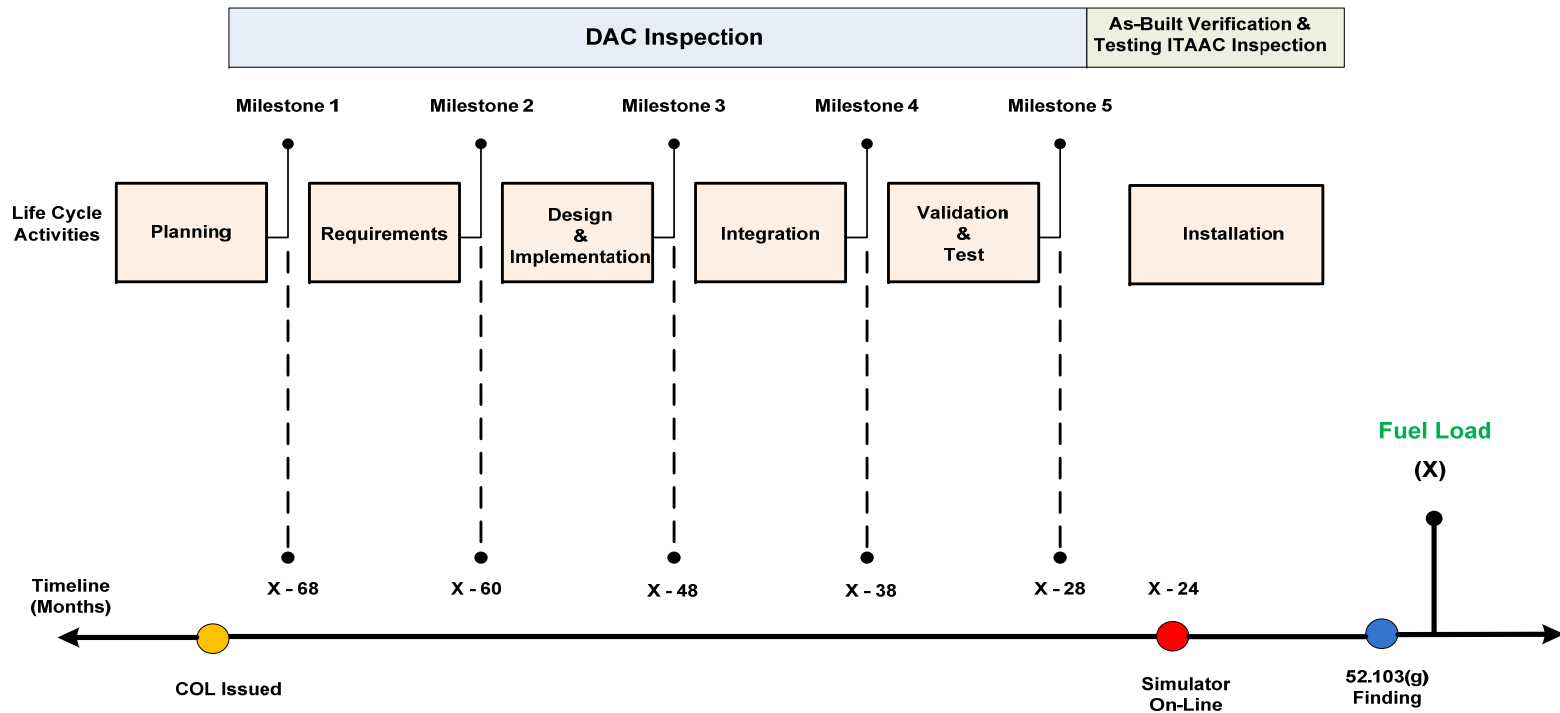
DAC Procedure – DI&C (cont.)

- **Inspection guidance borrowed from SRP, industry standards, NUREGs, RGs, staff expertise, etc.**
- **Focus: process, C/M, IV&V, traceability throughout the development life cycle (functional/regulatory requirements to system/software design to code to system integration to testing)**

DI&C DAC Inspection

- **Front-loaded effort for the life cycle Planning and Requirements phases**
- **Inspection conducted for each safety-related DI&C platform at development milestones**
- **Early and continuous engagement is KEY; allows for optimum deployment of inspection resources**

DI&C DAC Inspection Strategy



Digital I&C Development and Inspection Chronology (Notional)

Recent DAC Inspection Insights

- **Achieve common understanding on interpretation of the DAC ITA and AC**
 - among Staff
 - between Staff and Licensee
 - Licensee product and AC must align
- **Dedicated inspection planning is essential; resources are limited, technical staff involvement aids the planning effort and selection of inspection attributes**
- **Understanding organizational and document hierarchy can streamline the inspection effort (pre-briefs are valuable)**
- **Inspection effort has matched the level of technical review**
- **Technical staff has adapted quickly to inspection**
- **Smaller inspection team and more inspection time is optimum**

AP1000 DI&C DAC

- **1 DAC-related ITAAC for Component Interface Module (CIM) development (requirements phase)**
- **Staff will apply IP 65001.22 to other AP1000 DI&C ITAAC (non-DAC), specifically development of DAS and PMS**
- **Initial public meeting held w/ AP1000 DCWG to assess schedule and discuss plans for inspection in 2012 and beyond**
- **Planning more engagement w/ DCWG**

Expectations for 2012

- **Complete Piping DAC inspection process “tabletop” w/ AP1000 DCWG**
- **Commence inspection of Piping Design packages for AP1000 RCOL holder**
- **Commence inspection of AP1000 PMS/DAS ITAAC (2/2012)**
- **Complete inspection of AP1000 CIM DAC (6/2012)**
- **Complete HFE DAC procedures**

Conclusion

- Staff prepared now for Piping and DI&C DAC inspection
- Staff has the expertise to address DAC inspection for all disciplines
- Process brings appropriate technical rigor (breadth and depth of expertise) to bear
- Process is flexible and adaptable
- Process will enable Staff to verify that design implementation conforms to licensing basis

Discussion/Committee Questions