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NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

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REGULATORY POLICIES & PRACTICES SUBCOMMITTEE

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TUESDAY

SEPTEMBER 18, 2012

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ROCKVILLE, MARYLAND

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The Subcommittee met at the Nuclear Regulatory Commission, Two White Flint North, Room T2B1, 11545 Rockville Pike, at 8:30 a.m., William J. Shack, Chairman, presiding.

SUBCOMMITTEE MEMBERS:

WILLIAM J. SHACK, Chairman

HAROLD B. RAY, Member

JOHN W. STETKAR, Member

NRC STAFF PRESENT:

QUYNH NGUYEN, Designated Federal Official

BRIAN LEE, NRR/DSS/SCVB

BRUCE LIN, RES/DE/CIB

STU RICHARDS, RES/DE

GEORGE THOMAS, NRR/DE/EMCB

ANTONIO ZOULIS, NRR/DRA/APOB

C-O-N-T-E-N-T-S

P R O C E E D I N G S

8:29 a.m.

CHAIRMAN SHACK: This meeting will now come to order.

This is a meeting of the Regulatory Policies and Practices Subcommittee. I am Bill Shack, Chairman of the Subcommittee.

ACRS members in attendance are John Stetkar and Harold Ray.

Quynh Nguyen of the ACRS staff is the Designated Federal Official and Lead Cognizant Engineer for this meeting.

The purpose of this briefing is for the staff to discussion Revision 1 of Reg Guide 1.163, Performance-Based Containment Leak-Test Program. NEI guidance, staff bases for acceptance of previous risk-informed interval extensions, and staff considerations on whether there are any negative implications for the testing interval changes will be discussed.

We will hear presentations from representatives from the Office of Nuclear Regulatory Research and Nuclear Reactor Regulation. The Subcommittee will gather information, analyze relevant issues and facts, and formulate a proposed position and action, as appropriate, for deliberation by the

full Committee, if necessary.

The rules for participation in today's meeting were announced as part of the notice of this meeting, previously published in The Federal Register on September 12th, 2012. The meeting will be open to public attendance with the acceptance of portions that may be closed to protect information that is proprietary, pursuant to 5 USC 552(c)(4).

We have received no written comments or request for time to make oral statements from members of the public regarding today's meeting.

A transcript of the meeting is being kept and will be made available, as stated in The Federal Register notice. Therefore, we request that participants in this meeting use the microphones located throughout the meeting room when addressing the Subcommittee. Participants should first identify themselves and speak with sufficient clarity and volume, so they can be readily heard. Please silence all phones.

We will now proceed with the meeting, and I call upon Stu Richards from the Office of Nuclear Regulatory Research to make introductory remarks.

MR. RICHARDS: All right. My name is Stu Richards with the Division of Engineering in the

Office of Research. We are just glad to be here today. Thank you for the opportunity to come and talk about Reg Guide 1.163, and we look forward to your questions. It is an interesting topic.

CHAIRMAN SHACK: I guess it is a little strange that this is Reg Guide that is going to endorse -- I guess we have already got 75 reactors doing 15-year test intervals on a one-time basis. So, the Reg Guide essentially now lets them do that permanently.

MR. RICHARDS: Yes, it will.

CHAIRMAN SHACK: On their risk-informed with their submissions.

One other thing I had a question about in the Reg Guide, it refers back to the RIS. The RIS says it is going to take a license amendment to get longer than the 15 years, but I don't see the words "license amendment" anywhere in the Reg Guide. What is the controlling document in this case?

MR. RICHARDS: I would have to defer to our NRR colleagues.

CHAIRMAN SHACK: Okay.

MR. THOMAS: Yes, I am George Thomas, and I am in the Division of Engineering.

Actually, Appendix J, Option B, it

requires you to include by reference the implementing document in the plan, technical specifications. That is done through a license amendment.

With regard to the risks, the risks were meant to, you know, they should provide an NRC staff position, to discourage frivolous requests for extensions beyond 15 years by a few months. We have had requests for extensions within three months to 15 months, and many of those didn't have proper justification for this. So, this was meant to discourage that.

The staff position is that it will be approved only if there is a very compelling unforeseen --

CHAIRMAN SHACK: But it is a license amendment still?

MR. THOMAS: Yes, it requires license submittal.

CHAIRMAN SHACK: Okay. That was what I wanted --

MR. THOMAS: But the Topical Report allows you only 15 years as a maximum.

MR. LIN: Okay. Thank you, Stu. Again, thank you for inviting us to brief you on Reg Guide 1.163.

I am Bruce Lin. I work in Research, Division of Engineering. We are up here, George Thomas, Division of Engineering; Brian Lee in our Division of Safety Systems, and Antonio in our Division of Risk Assessments.

I think we already touched on the objectives. I am not going to brief you at this time. This is the outline of what we are going to talk about. I will just briefly go over some background and why we are updating the Reg Guide, and George and Brian are going to go over the guidance in NEI 94-01, which is the industry guidelines for implementing the performance-based --

CHAIRMAN SHACK: Oh, that is one other clarification. The copy of the Reg Guide that we have talks about Revision 2, and you have already got an SE on Revision 3. So, I assumed that, in reality --

MR. LIN: In reality, we will be endorsing Rev. 3A. And I sent a markup to Quynh.

MR. NGUYEN: Yes, in the Status Report it does reflect 3A.

CHAIRMAN SHACK: It does 3A?

MR. NGUYEN: Yes.

CHAIRMAN SHACK: Okay. In the Status Report. I just kept reading the old one.

MR. LIN: The containment leak test requirements are specified in 10 CFR Part 50, Appendix J. There are two options in Appendix J. Option A is prescriptive, and Option B is performance based.

There are three types of testing that are required: Type A test, or also called Integrated Leakage Rate Test. Basically, it measures an overall containment leakage. And Type B and Type C tests are called Local Leak Rate Tests. Type B tests are intended to measure the leakage of penetrations, and Type C tests are intended to measure the leakage for containment isolation valves.

Option B was issued in 1995. Basically, Option B allowed the licensees to replace the existing Option A requirements with testing requirements based on performance history.

And the technical basis for the Option B rulemaking provided in NUREG-1493 and, also, the EPRI report on "Risk Impact Assessments of Revised Containment Leakage Rate Test Intervals". Basically, both reports concluded that the risk associated with extending the periodicity is insignificant.

I would also like to point out that in The Federal Register notice that added Option B, the supplementary information described the NRC staff

rationale for settling on 10 years for Integrated Leakage Rate Tests and five years for the Type C, Local Leak Rate Test as "a cautious, evolutionary approach as data are compiled to minimize" the uncertainties.

Concurrent with the Option B rulemaking, in 1995, NEI issued Topical Report 94-01, providing Industry Guideline for Implementing Performance-Based Option of 10 CFR, Appendix J.

And also in 1995, NRC issued Reg Guide 1.163, "Performance-Based Containment Leak-Test Program," which endorsed NEI 94-01, Revision 0, with limitations and conditions.

As George pointed out, Appendix J, Option B, required that the implementing document used by licensees to develop a performance-based leakage program must be included in the plant Technical Specifications.

CHAIRMAN SHACK: What is the particular implication of that? I guess I am not quite sure why that is important. Doesn't this approval give them a 50.59 approach to doing this?

MR. LIN: I think they still have to come in with a license amendment to update.

MR. THOMAS: Yes, this is George Thomas.

Basically, the reason they have to come in for a license amendment is because the implementing document is in the Tech Spec. So, any change to the Tech Spec has to be done through a license amendment.

CHAIRMAN SHACK: Okay. They come in for the license amendment, so that they can, then, go to the risk-informed program, but they still keep that particular document that they used to justify that in the Tech Spec? So, if they wanted to change to a different document, they would have to come back for --

MR. THOMAS: The document used to implement will be in the Tech Spec, yes.

CHAIRMAN SHACK: Okay.

MR. LIN: Now, after Appendix J was issued in 1995, industry accumulated more testing data. So, in August 2007, NEI issued Revision 2 to the Topical Report. In Revision 2, they included provisions for extending the performance-based ILRT interval to 15 years and incorporated all the regulatory positions in Reg Guide 1.163. The risk impact assessment of extending the interval was provided in an EPRI Report 1009325, which Antonio is going to talk about in a later slide.

The NRC reviewed both the EPRI report and

the NEI Topical Report and issued a Safety Evaluation in June 2008. And NEI issued Revision 2A, which is a separate version of the NEI report, which included Safety Evaluations, in October 2008.

So, in 2009, the staff developed Draft Guide 1220 to endorse NEI Topical Report 94-01, Revision 2A, subject to the limitations provided in NRC Safety Evaluation.

Now, after we issued the Draft Guide 1220, NEI submitted Revision 3 to their report in June 2011. Revision 3 included guidance for extending Type C Local Leak Rate Test intervals from 60 months to 75 months.

CHAIRMAN SHACK: I am still confused here a little bit. Now, after you approved Rev. 2A, which allowed them to go to 15 years --

MR. LIN: Yes.

CHAIRMAN SHACK: -- why do they only get a one-time extension to 15 years? When they incorporate Rev. 2A into their licensing basis, why doesn't that mean they can go to 15 years?

MR. LIN: I think that one-time approval was before they sent in Revision 2, right?

MR. THOMAS: This is George Thomas.

The one-time approval was given to

licensees that had Reg Guide 1.163, Rev. 0, as the implementing document, which endorsed NEI 94-01, Rev. 0.

CHAIRMAN SHACK: Oh, but why didn't they just come back in for a license amendment to incorporate Rev. 2 as the implementing document?

MR. THOMAS: Yes, in fact, three licensees did come in, and they got approval using NEI 94-01, Rev. 2A, as the implementing document.

MEMBER RAY: You mean license renewal?

MR. THOMAS: No.

MEMBER RAY: You said relicense --

CHAIRMAN SHACK: License amendment.

MR. THOMAS: License amendment.

MEMBER RAY: Huh?

MR. THOMAS: License amendment.

MEMBER RAY: Okay. I thought he referred to relicensing.

MEMBER STETKAR: George, you said three licensees did that?

MR. THOMAS: Three licensees, actually.

MEMBER RAY: He said "three licensees" rather than "relicensing".

MR. THOMAS: Yes.

MEMBER STETKAR: Okay.

CHAIRMAN SHACK: Close.

(Laughter.)

MEMBER STETKAR: All right.

MR. THOMAS: So, they have an extension of ILRT interval to 15 years, as long as acceptable performance is maintained.

CHAIRMAN SHACK: Why only three?

MEMBER STETKAR: You don't need to push that?

CHAIRMAN SHACK: Okay.

MEMBER STETKAR: These are on all the time. That is a new button.

(Laughter.)

MR. THOMAS: But I am sure more licensees will come in.

MEMBER STETKAR: But three licensees came in in what time period? I mean, back in --

MR. THOMAS: Between October --

MR. LIN: No, after the --

MEMBER STETKAR: After Rev. 2A.

MR. LIN: No, after October 2008.

MR. THOMAS: Most of them will come in later because they are --

CHAIRMAN SHACK: Well, now three will give them more, yes.

MR. THOMAS: Yes. We already have a one-time approval and they have time to do that.

CHAIRMAN SHACK: It just wasn't clear to me, with the 2A, why the one-time approval came into the picture.

MR. LIN: I think the one-time approval was prior to Revision 2A.

Yes, the NRC reviewed Revision 3 and issued a Safety Evaluation approving Rev. 3 in June of this year, and NEI issued Rev. 3A in July of this year. So, Draft Guide 1220, the proposed one of Reg Guide 1.163, will endorse NEI Topical Report 94-01, Revision 3A, subject to the limitations provided in NRC Safety Evaluations for both Rev. 2 and Rev. 3.

And now, I turn it over to George and Brian to talk about the guidance in 94-01.

MR. THOMAS: Yes, I am George Thomas from NRR Division of Engineering.

I will provide an overview of the Topical Report NEI 94-01, Rev. 3A, for Type A testing and original examinations. And then, Brian Lee will continue the presentation related to Local Leak Rate Test.

Essentially, NEI 94-01, Rev 3A, delineates a performance-based approach for determining Type A,

B, and C containment leakage testing frequencies. The justification for extending intervals is based on performance history and risk insights.

The Topical Report includes guidance for extending performance-based Type A test intervals up to a maximum of 15 years and Type C test intervals up to 75 months. Also, the Topical Report incorporated regulatory positions in Revision 0 of Reg Guide 1.163.

MEMBER RAY: John, are you going to pursue the risk insights part of that?

MEMBER STETKAR: Yes.

MR. THOMAS: Now the Topical Report makes reference to industry standard ANSI/ANS 56.8, the 2002 edition, for specific details of testing methods and techniques.

With regard to Type A tests, the Type A test intervals can be extended from the initial 48-month interval in the Topical Report up to a maximum of 15 years, based on acceptable performance history and a supporting plant-specific confirmatory risk assessment that establishes the risk impact is small.

MEMBER STETKAR: George, should we hold questions about the kind of technical basis for this until you get through with the kind of regulatory issue part of it?

MR. THOMAS: Yes.

MEMBER STETKAR: Okay.

MR. THOMAS: And there will be a presentation on the risk proposal, right, by Antonio, in more detail.

MEMBER STETKAR: Okay.

CHAIRMAN SHACK: Chomping at the bit.

(Laughter.)

MR. THOMAS: Acceptable performance history is defined as successful completion of two consecutive periodic Type A tests where the calculated performance leakage rate was less than 1.0 times La. La is expressed in percent rate for 24 hours, is the maximum allowable leakage rate at the test pressure of Pa, as specified in the Tech Spec. And the test pressure Pa is the calculated peak containment internal pressure related to a design-basis loss-of-coolant accident, also specified in the Tech Spec.

A Type A test failure report, the guidance requires corrective action, followed by a successful Type A test prior to resuming operation. Another successful periodic Type A test must be completed within 48 months in order to reestablish performance before the test interval can be again extended to 15 years.

The Topical Report also specifies pretest and supplement visual inspection requirements to provide continuing supplemental means of identifying potential containment degradation.

MEMBER STETKAR: George, let me ask you a non-risk question, but it will help me understand something later. What is the shortest-possible interval for these two consecutive successful tests under this program?

MR. THOMAS: That is 24 months.

MEMBER STETKAR: Twenty-four months. So, a test at time zero, let's call it, has a success. Twenty-four months later, has a success. And now, I can extend it to 15 years?

MR. THOMAS: Yes, but, normally, the interval specified is 48 months. But it cannot be shorter than 24 months.

MEMBER STETKAR: But the shortest interval -- I am thinking a new plant, for example. I read a little bit of the background.

MR. THOMAS: Right.

MEMBER STETKAR: And for a new plant, I can do essentially a pre-op test that satisfies it.

MR. THOMAS: Yes.

MEMBER STETKAR: Twenty-four months later,

do my first interval, and I am good to go for 15 years?

MR. THOMAS: It has to be a periodic test after pre-operation. For a new reactor, for example, they would have a pre-operational Type A test. Then, they would do another one within 48 months. And then, they would need to do a second one in the next 48 months to establish --

MEMBER STETKAR: Oh, okay. I thought I understood it that they could take credit for the pre-op test.

MR. THOMAS: They could take credit for the pre-op test in certain situations. For example, if the licensee performed a pre-op Type A test, and they did not go operational for more than three years before the plant went operational. In that situation, they would have to do a second pre-op test just before going operational, and then followed by a 48-month test. In that situation, the second pre-op test could be justified as Type A test.

MEMBER STETKAR: But not if they do an initial, what is called an initial pre-op test and enter operation six months after that test?

MR. THOMAS: Then, that is not considered a periodic test.

MEMBER STETKAR: But the second pre-op test, in your later example where they do a pre-op test and then sit around for three years, that next pre-op test is, then, considered a periodic test?

MR. THOMAS: In that situation, it could be.

MEMBER STETKAR: It could be?

MR. THOMAS: Yes.

MEMBER STETKAR: Who decides whether it is or isn't? And how is that decision made? I mean, it sounds like -- I want to understand this because I am trying to understand timelines here.

MR. THOMAS: The pre-op test is used as a periodic test, that test to be justified by the licensee in their documentation. For example, if they did a pre-op test and within a month they went into operation, that would not be counted as a periodic test.

MEMBER STETKAR: Okay, that one I got.

MR. THOMAS: Yes. So, they would do another one within 48 months. That would count. And then, they have do a second one in the following 48 months.

MEMBER STETKAR: Yes. And that second time interval in that case could be as short as 24

months?

MR. THOMAS: Yes.

MEMBER STETKAR: So, essentially, six years into the operating life of the plant, they could then justify going out to --

MR. THOMAS: Yes.

CHAIRMAN SHACK: Well, even the first one, could they do in 24 months instead of 48?

MEMBER STETKAR: Yes.

CHAIRMAN SHACK: So, they could do 24 and 24. So, they would do four years and then go --

MEMBER STETKAR: Yes, I guess that is right. There is nothing saying that they have to wait until 48.

CHAIRMAN SHACK: Wait until the 48. They just have to do it within the 48.

MR. THOMAS: Right.

CHAIRMAN SHACK: So, it could be as short as four years, and then you extend?

MEMBER STETKAR: From time of initial operation?

MR. THOMAS: Yes.

MEMBER STETKAR: Okay. It could be as short as four years.

Now, let's talk about the second example

you had where they do, let's call it, a pre-pre-op test, sometime in history, and then, for whatever reason, they sit around for an extended period of time and do another, and I will call it a test, before they go into operation. How does one justify that pre-going-into-operation test as a periodic test under those conditions? How do you know that the status of the valves and the containment and the systems has not changed during that intervening period between those two pre-time-zero tests?

MR. THOMAS: Well, the second pre-op test would have to look into all those again.

CHAIRMAN SHACK: Yes, I mean, the environments and everything would not necessarily be those of an operating plant. Or you are saying that is something you would have to justify in order to make that case --

MR. THOMAS: Right, right.

CHAIRMAN SHACK: -- that that could be accepted, that somehow it wasn't an environment similar to what it would have experienced? So, that would be part of the demonstration you would have to do?

MR. THOMAS: Right. Yes. Yes, the Topical Report, we generally say that it is a pre-op

test, that it needs to be used as a periodic test. The licensee will have to justify that in their documentation.

MEMBER STETKAR: But in that case, they could do that test, go into operation, two years later do their second test, and after two years in operation they could get justification for extending the 15 years, is that correct?

MR. LEE: Yes.

MEMBER STETKAR: Okay. Thanks.

MR. THOMAS: With that, we show examinations. Appendix J, Option B, requires a general visual inspection of accessible interior and exterior containment surfaces for structural deterioration that could affect leak-tight integrity be conducted prior to each Type A test and at periodic intervals between the tests.

To satisfy this, NEI 94-01 specifies general visual examinations of accessible interior and exterior surfaces to be conducted prior to each Type A test and during at least three other outages before the next Type A test if the interval has been extended 15 years.

To avoid duplication and/or omissions, NEI 94-01 recommends that these visual examinations be

performed in conjunction or coordinated with the ASME Code Section XI, Subsection IWE and IWL examinations required by 10 CFR 50.55a.

The guidance requires deficiencies identified be entered into the plant's corrective action program to determine cause and appropriate corrective actions.

MEMBER STETKAR: George, I hate to keep dragging you back to this, but we certainly have ample time here. So, I was just trying to draw myself a little timeline. I will bring you back to this two pre-time-zero tests.

If they do an initial pre-op test and it fails, and then they wait some period of time before they go into operation, and then they do the second pre-op test and it passes, can that be considered a periodic test?

MR. THOMAS: No.

MEMBER STETKAR: It can't?

MR. THOMAS: It can't.

MEMBER STETKAR: Okay. Thank you.

MR. THOMAS: Because the first one failed.

MEMBER STETKAR: Because the first one failed. Okay. Thank you.

MEMBER RAY: Well, John, my takeaway from

all of that is what I guess Bill says, which is, why should the second pre-op test ever qualify as a periodic test?

MEMBER STETKAR: Yes, I am trying to understand how that, what conditions classify that or qualify it as a periodic test in the same sense of a periodic test once the plant is actually operating at power with the environment, temperatures, you know, pressure/temperature transients that the containment normally goes through.

MEMBER RAY: And I think what I heard, but it was a little confusing, was to ever use a pre-op test as a periodic test requires specification --

MEMBER STETKAR: That is what I heard, yes.

MR. THOMAS: Now 10 CFR 50.55a requires a containment In-Service Inspection program to be developed and implemented of Class MC/Class CC containment pressure-retaining surfaces in accordance with the applicable editions and addenda of the ASME Code, Section XI, Subsection IWE and IWL. That is incorporated by reference in 50.55a and subject to certain regulatory conditions.

Subsection IWE requires general visual examinations of 100 percent of accessible Class MC

pressure-retaining surfaces and metallic liners of Class CC containments, as well as the moisture barriers, to be performed three times during a 10-year ISI interval. The ISI interval in Section XI is usually 10 years. This amounts to about four examinations over a 15-year ILRT interval.

Subsection IWL requires general visual examination of accessible Class CC concrete pressure-retaining surfaces to be performed every five years. This would correspond to approximately three examinations over a 15-year ILRT.

Suspect areas identified during these inspections are subject to more detailed/augmented examinations and evaluations and, if necessary, repair/replacement to correct.

The staff found the guidance in Topical Report NEI 94-01, Revision 2A, as with 3A, acceptable for referencing in the Tech Spec to extend the Type A test to up to 15 years, provided the following limitations and conditions are satisfied in the license amendment request:

The first condition is that, for calculating the Type A leakage rate, the licensee should use the definition in the Topical Report NEI 94-01 in lieu of that in ANSI/ANS Standard 56.8.

Basically, the ANSI standard defines performance leakage rate of the sum of the measure Type A test at the confidence limit and, as left, the minimum Type A leakage rate from all Type B and C pathways isolated during the test.

The NEI 94-01 definition is more specific and more inclusive and considers leakage that takes place during performance of the test. Basically, it defines performance leakage rate as the sum of the Type A upper confidence limit leakage and the minimum pathway leakage for all Type B and C pathways that were in service, isolated, or not lined up in the test position prior to performing the Type A test. In addition, leakage pathways that were isolated during the performance of the test because of leakage must be factored into the performance determination.

The second condition is that the licensee submits a schedule, an approximate schedule, of containment inspections to be performed prior to and between Type A tests. This condition is essentially to make sure that the licensee is implementing the general visual examination performance properly.

CHAIRMAN SHACK: Now, with the new Reg Guide and the new SER, will they still have to submit that schedule or they will just have to have a

schedule that you could go look at?

MR. THOMAS: Usually, they provide a typical schedule for 15 years, an approximate, in the maximum amendment list, just as an example, you know.

CHAIRMAN SHACK: That is for a typical 15-year then, not the specific 15-year?

MR. THOMAS: Correct. And it could change. It is just, you know, we review this application only one time when they come in, just to make sure that they are implementing their inspection programs appropriately.

The third condition is that licensees address areas of containment structure potentially subjected to degradation. Essentially, this condition is for licensees to identify any degradations in several areas in their containment and the operating experience, especially with regard to inaccessible areas. It is also meant to encourage licensees to proactively explore and consider new NDE technologies for inspection of inaccessible areas, although fully recognizing that such techniques are not commercially-viable at this time, but that is to encourage licensees to look into newer technologies which could be used in the future.

The fourth condition is that licensees

address any tests and inspections performed following major modifications to the containment structure. This can be shown essentially to ensure that the licensees understand that any major modification of containment, such as creation and restoration of an opening for steam generator replacement or reactor head replacement or replacement of large penetrations, must be followed by a Type A test or an equivalent sort of test that would demonstrate both structural as well as leak-tight integrity.

The fifth condition is that the normal Type A test interval should be less than 15 years. This condition was basically to discourage frivolous requests for extension beyond 15 years. The staff position is that the 15 years is an upper-bound performance-based-consistent interval, and any extension beyond that should be infrequent and only under compelling, unforeseen emergency conditions. This staff position has been clarified in RIS 2008-27.

CHAIRMAN SHACK: I guess that comes back to my original question. Why not just include that language in the RG instead of referring back to the RIS?

MR. THOMAS: Actually, we have a condition, right, in the first one?

MR. LIN: Yes.

MR. THOMAS: That language has been included as the first regulatory provision.

CHAIRMAN SHACK: But it just takes it back to the RIS again in the first regulatory -- at least in the version I am looking at. I may not have the --

MR. LIN: It does refer back to the RIS.

CHAIRMAN SHACK: Right, but why not just include the RIS language that says this will be a license amendment right in the Reg Guide, rather than have them refer back to the RIS. I mean, I always think of RIS as somehow less permanent than a Reg Guide. You know, the Reg Guide is the authoritative guidance.

MR. THOMAS: The RIS is a little more voluminous.

CHAIRMAN SHACK: Right, but as far as the restriction that you really want, you know, this is it; you have to have good reasons and you have to come in for a license amendment if you want to change it. It seems to me something that I would like to see right in the Regulatory Position No. 1.

MEMBER STETKAR: It certainly would provide clarity in the document that --

CHAIRMAN SHACK: It would certainly

provide clarity.

MEMBER STETKAR: -- people will directly refer to.

MR. LIN: Yes, I think we have the same interface with Regulatory Position 1, which is the same statement that is in here, that the normal test interval should be less than 15 years. NRC staff considers 15 years as the upper-bound limit. And then, we refer to the RIS for more detailed discussion, but I guess we can --

CHAIRMAN SHACK: You could add one more sentence that says it is going to take a license amendment to get beyond this. That would make me happier.

MEMBER STETKAR: Good takeaway.

MR. THOMAS: And the last condition is a general one for new reactors. It says that for plants licensed under Part 52, applications requesting permanent extension of the ILRT surveillance interval to 15 years should be deferred until after construction and testing of containments for that design have been completed and applicants have confirmed the applicability of NEI 94-01, Rev. 2, and the EPRI Report 1009325 for the risk assessment.

There is one more slide.

With regard to operating experience, the majority of licensee have requested to receive one-time approval from 10 years to 15 years. Three plan to receive approval by extension of the performance-based ILRT to 15 years directly, based on adopting NEI 94-01, Rev. 2A, the implementing document.

With regard to the operating experience related to containment testing, there have been no reported Type A test failures as far as the result of extending frequencies to 15 years.

CHAIRMAN SHACK: Of course, if it is in 2008, it is a little early yet.

MR. THOMAS: No, including the ones that have done one-time.

CHAIRMAN SHACK: But they only started in 2008, right?

MR. THOMAS: No, one-time extensions were given from 2000?

MR. LEE: 2002.

MEMBER STETKAR: To ask it a different way, how many plants have actually done testing under the extended interval? I mean, you know, countable numbers. Two? Three? Twelve?

MR. LEE: How many plants have been granted a one-time extension?

MEMBER STETKAR: And done the tests. We are trying to struggle with, you say that none have failed, but if none have actually performed a test, that wouldn't be surprising. If one performed a test and it didn't fail, well, that is information. If 107 have performed a test and they didn't fail, that is additional information.

MR. LEE: Yes, it is not that many. It is about five.

MEMBER STETKAR: About five?

MR. LEE: Yes.

MEMBER STETKAR: Okay.

MR. THOMAS: Most of these plants that got the one-time extension, their last test was in the nineties.

MEMBER STETKAR: So, they really haven't done their next test yet?

CHAIRMAN SHACK: Well, I mean, you would have gotten a 10-year extension in the 1994-95 timeframe, right?

MR. THOMAS: Correct. And then, they come back and get another five years. So, that made it 15.

CHAIRMAN SHACK: Okay. So, they should have been doing that. So, that is your five, then, They are somehow doing them now in this --

MR. LEE: Right.

CHAIRMAN SHACK: -- in this timeframe?

MR. THOMAS: We don't have a number, but I would think there are more --

CHAIRMAN SHACK: If 75 got it, then sometime between 2010 and 2015 we should see something on the order of 75 tests in that timeframe.

MEMBER STETKAR: Not necessarily. It depends on when the plant came online also. I mean, if they put in for it, but they first came online --

MR. THOMAS: And even I would think it is more than five --

MEMBER STETKAR: -- in 1989 or something like that, we wouldn't see it yet.

MR. THOMAS: The ones that have completed, I think it will be more than five, but I don't have a number right here. Probably many more than five.

MEMBER STETKAR: Since you make a point of that, and people make a point, "Gee, nobody has failed one during this extension," well --

CHAIRMAN SHACK: It would be nice to know how many were done.

MEMBER STETKAR: -- if you are one-for-one, that is interesting. If you are 25 for 25, that is a little more interesting.

MEMBER RAY: Yes, I mean that it seems that we are struggling here with a simple proposition, which is, how many plants have passed a Type A test after an extended period of operation? And conversely, have any failed? I think the answer is nobody has failed during an extended period, following an extended period test. Is that correct?

MEMBER STETKAR: Yes. I mean, that is what they have said.

MEMBER RAY: All right.

MEMBER STETKAR: But, I mean, hanging your hat on, since we are dealing with rare events here --

MEMBER RAY: That isn't quite literally what it said up there, but, nevertheless, I understand that is what they mean.

MR. ZOULIS: I mean, we know there have been 217 tests. Now what fraction of that were after the extension --

MEMBER STETKAR: That's right.

MR. ZOULIS: -- we don't know.

MEMBER RAY: Yes, but it should be a simple thing to learn.

MR. THOMAS: Normally, it gets reported to the NRC only if there is a failure.

(Laughter.)

I mean, we could go look back into the Tech Specs and look at dates.

MEMBER STETKAR: Well, they have to report that they did the test --

MR. THOMAS: Yes.

MEMBER STETKAR: -- because they need to satisfy their Tech Spec. So, there needs to be a checkoff box. And we are not talking about tens of thousands of tests here and the entire history of the nuclear fleet in the United States. There are only a few hundred at the most.

MR. THOMAS: No, the resident in the region follows it up when the tests are performed. It is just we don't have that information.

MEMBER RAY: Okay, but we are revising the Reg Guide here, and it would be really embarrassing if it turned out that there were some data during this time period when we are making this change that suggested that extended-period testing wasn't turning out the way we were assuming that it was. And it is just a question of what kind of data do we have and what does it say.

MR. RICHARDS: George, it doesn't sound like it would be that hard to get this information. Could we commit that we would run this down and then

provide that information to the ACRS members?

MEMBER STETKAR: Yes, I think that would be useful. The only problem is, you know, if it weren't called out as a bullet, kind of reinforcing this notion that everything is okay --

MR. RICHARDS: No, I understand your point.

MEMBER STETKAR: -- you would say okay.

MR. RICHARDS: Sure. So, I think we can provide that.

MEMBER STETKAR: Limited experience on rare-event data is questionable.

MR. THOMAS: Okay. Now I will turn it over to Brian Lee to continue.

MR. LEE: I am going to discuss about the performance-based Type B and Type C tests. These test intervals may be increased from 30 months to a maximum of 120 months for Type B tests and up to a maximum of 75 months for Type C tests. These extensions are allowed based upon the completion of two periodic as-found tests where the results are within the licensee's allowable administrative limit. These administrative limits for leakage rates shall be established, documented, and maintained for each component prior to the performance of the Local Leak

Rate Test. This is in accordance with the 2002 ANSI standard. A failure to find is a valve exceeding its administrative leakage limit.

Now, during the development of Revision 3 of NEI 94-01, NEI did a study where they collected data for a time period of 1996 to 2010 on Type C valves on extended intervals, and the results were documented in EPRI Report 1022599.

The staff performed its own review of this report and found that the valves tested on extended intervals was about an order of magnitude less than what was reported in NUREG-1493 on the general population of valves tested prior to 1995.

MEMBER STETKAR: Do you have any notion of why that is?

MR. LEE: I would say better maintenance; stronger, better corrective action program.

MEMBER STETKAR: Did you examine whether -- I didn't have a chance to look at that particular EPRI report. Oftentimes, we see notions that people redefine what a failure is. They do screening, that, well, this really wasn't a failure because we decided that it isn't a failure. Did any of that type of pre-screening, was that performed in that EPRI report?

MR. LEE: It is pretty much

straightforward that a failure is any valve that has exceeded its administrative limit. So, in the report they listed the number of Type C valves, the actual administrative leakage limit, and how many valves failed.

MEMBER STETKAR: And they didn't do any type of cause-based screening?

MR. LEE: No.

MEMBER STETKAR: Okay. Thank you.

MR. LEE: So, this report validated risk impact assessment of the EPRI Report 104285, which was back in 1995, on the Type C valves on extended intervals. It further showed that the leak-tight performance of the Type C valves on extended interval is actually better, or were better, than the general population of valves tested prior to 1995.

MEMBER RAY: John, I think if I could suggest people learn in doing testing how to do tests.

MEMBER STETKAR: Sure.

(Laughter.)

MEMBER RAY: So, rather than maintenance, I would say it may well be that you just learn when to conduct the test and what to do before you conduct the test, so that you don't fail the test.

MEMBER STETKAR: Yes.

(Laughter.)

MEMBER RAY: Okay.

MEMBER STETKAR: There is that, too.

Before you switch them, something that I have been thinking about here a bit, we refer a lot -- and then, I will ask Antonio when he finally comes up also, so you might want to think about this -- we refer a lot to the data that have been collected from the current operating three plants regarding successful performance of the tests, failures of the tests, causes for the failures, and derive failure rates based on that information, and then use some sort of method to essentially extrapolate those failure rates out in time to give us some sort of confidence that, indeed, extending these intervals is justified.

The Reg Guide also applies to new plants, plants that have never operated before, new designs. It applies to new reactors. I don't necessarily know what their valves may look like. They will probably look quite a bit like valves that we have installed in the plants, but in some cases they might not.

How does the information that has been compiled from the current operating fleet apply to new plants when they come online? Because the Reg Guide

does apply to plants licensed under Part 52. So, for example, I can start up a new plant, go through whatever gymnastics of, I will call it, pre-operational testing or periodic testing. Even if I do two periodic tests within four years after the startup of that plant, it might be the first of its kind that has never operated before here, I now don't need to do this test for another 15 years or, in the case of Type B and C, another six years, six-and-a-half or whatever it is, 75 months.

MR. LEE: That is a good question. The only thing that is in place right now is the two periodic as-found tests for the penetration for the isolation valves.

MEMBER STETKAR: The reason I ask, in some of the design certification things -- and, Bill, correct me if I have misremembered this -- there has been some concern about new and innovative-type equipment designs may not be -- you may not be able to apply the same type of risk-informed extensions of Tech Spec intervals, you know, testing intervals under Tech Specs for new and innovative equipment design.

People are working this out in the design certification process right now, but we have had some discussions of that nature. For example, the large

squib valves on some of the designs, we said, well, you probably can't apply at time zero for risk-informed surveillance interval extensions for those valves because we really don't know much about them. Whereas, another plain vanilla motor-operated valve perhaps, you might be able to. As I said, I think the staff is still working through this because they haven't yet had a risk-informed application for Tech Spec surveillance intervals yet. There is one applicant that is considering that.

So, I guess my question kind of derives from that experience.

MR. ZOULIS: One of the things and one of the justifications for why it is okay to extend the integrated leak rate testing from 10 to 15 or from 3 to 15 years was that the tests didn't -- the value-added of doing the tests wasn't justified for the time for doing the outage expense and all of that involved in the test.

And part of it was because a lot of the other things that the plant is doing, the visual inspections, the other local leak rate tests, give you most of the information that would identify any large leak, potential large leak.

So, in terms of the failures of the

valves, it may be more pertinent for the extension of the B and C tests, but from the Type A perspective it would have been playing a role.

MEMBER STETKAR: Yes, the reason I was asking is more because of the B and C tests, where it is more relevant to equipment failure rates, if you will, details of the plant-specific equipment.

MR. ZOULIS: But, again, for the B and C testing, the interval change I think is not going to be that significant that it is going to modify your LERF. I mean, we have found that LERF is very insensitive to changes because it is dominated by the core damage frequency --

MEMBER STETKAR: Yes.

MR. ZOULIS: -- you know driving the sequences. Then, you have to have containment failures as a release.

MEMBER STETKAR: When I think of risk assessments, I think of large early releases is one thing. Small containment isolation failures is something else. So, I recognize Reg Guide 1.174 constrains you to look at something called LERF. I think of having something happen at the plant and having an unisolated containment that has a release. It might be a 2-inch line. That is not a LERF.

MR. ZOULIS: Right.

MEMBER STETKAR: It is not a good day at the nuclear power plant, however,

MR. ZOULIS: But I think for our meeting today we ran into the pros and cons of risk-informed, you know, whether we should be looking at LERF, whether we should be looking at all releases or --

MEMBER STETKAR: Right. That is a different issue, but I want to make sure that, just because we are focused on LERF in the context of the supporting analyses, we don't somehow suddenly overlook something that could be a problem, because there are a lot more isolation valves and there are a lot more penetrations and leakage paths that don't get you to a large early release or a large release, I would characterize that, in a typical containment. And these tests apply to all of those other things also.

Okay. I think you may want to think about new plants as they come on line, because I will grant you we do have an experience base that has been derived over something on the order of now 35 years or more of operating experience.

MR. ZOULIS: I mean, your question about the ability of the data to new components that are

different than the existing population, I mean that would have to be evaluated as part of your risk assessment to make sure that you are not applying generic data that doesn't fit to your valve data. I mean that would be supported by the ASME. I think the ASME standard has a criterion there that you are supposed to test your data and make sure that it is applicable.

MEMBER STETKAR: So, you just fall back to justification in the plant-specific risk assessment for the applicability of the --

MR. ZOULIS: Right. I mean, they have to be Reg Guide 1.200-compliant to be able to come for any kind of a license change. And then, that links it to the ASME standard and, hopefully, it has been peer-reviewed and evaluated the data, it is shown to be valid. And that is their whole basis for the risk-informed process.

MEMBER STETKAR: That is a good point, ye. Thank you.

Sorry, Brian.

MR. LEE: Oh, no problem.

The regulatory limit for the combined leakage rate for all penetrations involved in Type B and Type C tests shall be less than 0.60 La, which

George explained La is the maximum allowable leakage at calculated peak pressure.

In Section 12.1, a revision was made to require that the post-outage report shall include the margin between the Type B and Type C leakage rate summation and its regulatory limit.

And if any adverse trends shall occur to the summation, it should be identified in this report and a corrective action plan developed to restore the margin back to an acceptable level.

In the SER for Rev 3A, the staff identified two limitations and conditions. The first pertains to extensions of up to nine months for non-routine emergent conditions. However, this provision does not allow valves that are restricted and/or limited to the 30-month test interval or valves that are known for poor leakage performance to be granted this extension.

MEMBER STETKAR: Those valves that we know have a poor leakage performance today?

MR. LEE: Yes. They will be on the base 30-month test interval, until they reestablish a good performance.

MEMBER STETKAR: Okay.

MR. LEE: Okay. The second condition

deals with the Appendix J program. Trending and monitoring must include an estimate of the amount of understatement for the Type B and Type C total, and this must also be included in the outage report. The report must include the reasoning and determination of the acceptability of the extension, demonstrating that the Local Leak Rate Test totals calculated represent the actual leakage potential of the penetrations.

MEMBER STETKAR: I will ask it now, since you do have that nice little parentheses "(e.g., BWR MSIVs)".

MR. LEE: Okay.

MEMBER STETKAR: We have had an example where people passed valve acceptance tests on main steam isolation valves for many consecutive years, and the performed a test and two or three valves stayed open for an awfully long time and discovered that there was a developing condition, either because of inadequate maintenance or missed things, or whatever, that caused that to happen.

So, suddenly, now we have valves that -- now you have called out BWR MSIVs because everybody knows that is a very important valve. Maybe I know that there are other very important valves; maybe I don't. I don't know.

The reason I ask about these questions about things that we know are important today, if BWR MSIVs weren't called out in the past because everybody didn't know they were very important, and then we had this experience that, gee, this is an unexpected failure that nobody ever thought about, and it is something that has been accruing over time, and, yes, if you did the forensics you could go back and perhaps justify the fact that maybe you should have known about it, but, in fact, nobody did.

That is a bit of my concern about saying, well, things that we know about, we will take a look at and be careful about. Things that we don't know about, we will let go because we don't know about it.

Do you follow my reasoning that this notion that important valves you are not allowed to have an extension on? Or certainly ones that have had a problem in the past, a known problem in the past. I am not arguing that.

But valves that have performed successfully in the past, the presumption is that we know everything there is to know about those valves and that there is nothing that can happen to those valves that would cause their failure rate to increase as a function of time, and we have just not detected

that yet, as is the case with those MSIVs.

Have the supporting analyses looked at that type of phenomenon, considered it?

MR. LEE: For the MSIVs?

MEMBER STETKAR: No, for any type of valve.

MR. LEE: You are talking about in that EPRI report that they submitted?

MEMBER STETKAR: Yes.

MR. LEE: No.

MEMBER STETKAR: Okay.

MR. LEE: They didn't.

MR. ZOULIS: I will tell you, though, one of the specific examples that occurred recently, the issue involved failure to appropriately classify the valve as important. So, if it was classified correctly, there shouldn't have been any issues under the AOV program.

And that goes back to what you were stating, that if you make sure that the important valves you have are classified correctly as important, then you shouldn't have an issue. And part of the reason, I think, was that they looked at the contribution, not the contribution but to LERF, or vice versa -- I can't recall exactly -- but, I mean,

your point is a very important one.

Your AOV program which ranks a lot of these valves must take into account the risk contribution from those valves in both LERF and CDF and classify them correctly, so that they do get the attention that they need to make sure that they work properly.

And, of course, as in any program, there are going to be failures or misses where that occurs, but --

MEMBER STETKAR: The nice thing about testing is that the test doesn't care about how somebody has classified a valve in some study. It either works or it doesn't work. That is the nice thing about testing. Then, you discover the fact that it was misclassified or --

MR. ZOULIS: But I guess my point was that the testing wasn't blanketedly not being conducted; it was that it was incorrectly classified --

MEMBER STETKAR: No, I understand. I understand.

MR. ZOULIS: Yes.

MEMBER STETKAR: Okay.

MR. LIN: I mean, the test requirement could also be different. It depends on how you

classify the valve.

MEMBER STETKAR: That is right.

MR. LIN: Yes.

MEMBER STETKAR: That is right. But, see, the test requirement can be different. If I classify a valve as unimportant, I am allowed less onerous testing, let's call it that way. And if I start extending testing intervals, I perform that less onerous testing even less frequently and have less of an opportunity to discover something that should have been classified as important, but wasn't.

Okay. Thanks.

MR. LEE: To sum this portion of the presentation up, the major difference between Rev. 0 and Rev. 2A was Rev. 2A includes provisions for extending Type A tests to permanent, continuous. The major difference from going from 2A to 3A is that 3A includes guidance on extending Type C valves from 60 months to 75 months.

And the Appendix J program, in conjunction with the containment and service inspection program, together ensure that the containment structural and leakage integrity is maintained through the service life.

MEMBER RAY: What do the Europeans do?

MR. LEE: Are you asking are they on extended frequencies?

MEMBER RAY: I am just asking what they do when it comes to containment leakage test.

MR. LEE: I think they are on 10-year frequencies, I believe.

MEMBER STETKAR: I suspect it must be a 10-year because a lot of them are on the 10-year periodic safety review.

MEMBER RAY: Right. It is an integrated leak rate test?

MEMBER STETKAR: I don't know that.

MEMBER RAY: Yes. Okay.

MEMBER STETKAR: That I don't know, Harold.

MR. THOMAS: France does it on 10-year intervals.

MEMBER RAY: And what about the B and C? Got any idea?

MR. LEE: I am not sure. Do you know? I am not sure about their Local Leak Rate Test.

MR. ZOULIS: Good morning.

As Bruce indicated, my name is Antonio Zoulis. I am with the Office of Nuclear Reactor Regulation in the Division of Risk Assessment.

I kind of feel I am the main act. I hope I don't disappoint today.

My discussion will focus on the risk aspect of the Integrated Leak Rate Testing, known as ILRT, the interval extension; specifically, the methodology found in the EPRI report "Risk Impact Assessment of Extended of ILRT Intervals" and the Safety Evaluation which found the method acceptable to meet our regulatory requirements. So, I will cover both the SE and the EPRI report.

NUREG-1493, as mentioned above, used risk-informed criteria to support modifying the regulation to reduce unnecessary regulatory requirements found in Appendix J. The EPRI report built on the methodology and supports our risk-informed process which uses risk insights, together with other factors, to better focus licensee and regulatory attention on design and operation issues commensurate with their importance to health and safety.

The NRC approach is not risk-based due to the aleatory and epistemic concerns in these methods and the processes and programs which we regulate. So, we are risk-informed, not risk-based, in our evaluation and these changes to the license.

Next slide.

The key principles in the risk-informed process which support integrated decisionmaking are displayed here and are in found in Reg Guide 1.174 and other risk-informed guidance, 1.177.

So, basically, when the licensee comes in for a change, he or she still needs to meet the current regulation. The change has to be consistent with defense-in-depth philosophy. It is not that they cannot change or alter their philosophy. It has to be consistent with changes to support defense-in-depth philosophy.

They need to evaluate their safety margins, make sure that the change doesn't adversely impact their safety margins. The change in risk needs to be small and has to consistent with the Commission's safety goals.

And I think the most important thing that is the theme, I think, that keeps on coming up today is the performance monitoring. Part of our criteria is that they set up performance-measuring strategies to make sure that that change does not impact, adversely impact, the safety function of the system that are in question.

So, basically, the EPRI report concludes, and we agreed with our SE, that NUREG-1493, the

conclusions were still valid, that the risks associated with these changes is very small. And the report basically develops a generic method which is then applied by each licensee using their plant-specific risk assessments to evaluate the risk for their plant change.

And I mentioned earlier, to do that, they must be Reg Guide 1.200-compliant. So, they have to meet the ASME standard to even consider making a change of this nature.

Next slide.

MEMBER RAY: Let me ask this question.

MR. ZOULIS: Yes.

MEMBER RAY: I doubt very much that the 15 years or the other durations are derived from risk-informed considerations. They are supported by those, but I take it, I assume -- correct me if I am wrong -- that the durations are based on, let's call it, engineering judgment or some reason. Why not make it 20 years, 25 years, 30 years? There is some reason why 15 years is as far as we are going to go.

What supports that? Do you have anything support? Or is it just we don't want to go beyond this point?

MR. THOMAS: Well, it is just, as was

mentioned, a cautious evolution of the approach.

MEMBER RAY: Say more. Again?

MR. THOMAS: A cautious evolution of the approach.

MEMBER RAY: Yes. So, it is as far as we want to go. We don't want to go any further than that.

MR. ZOULIS: Also, one of the other factors was, if a plant went for license renewal for 20 years, we didn't want them to go through a whole 20-year period without one test. So, we have kind of kept it at 15, so that, hopefully, between the 20-year licensing, they would have at least one other test done in that period. So, that was part of the justification also.

MEMBER RAY: Okay.

MR. ZOULIS: Next slide, please.

Again, CDF is not significantly impacted by the extension of the ILRT interval. However, plants that do rely on containment accident pressure for the ECCS need to assess that impact in their risk assessment. And I will discuss this later. They must come in for license amendment. If they take credit for containment accident pressure, they come in; they cannot just do a 50.59 change and just submit a

license amendment for that.

Next slide.

Again, the figure of merit for this evaluation, whether right or wrong, is LERF. In addition to LERF -- well, I mean, that is our risk-informed process. I mean, it has a whole different meaning if you want to change that.

But it also, though, does take into account the increase in the population dose and the increase in the conditional containment failure probability. So, the methodology also evaluates those impacts to the public, I would say to the public.

Next slide.

MEMBER STETKAR: I will let you get through your slides before I ask a bunch of questions.

MR. ZOULIS: So, basically, the change in LERF is derived by the change in the Integrated Leak Rate Test failure probability. In this case, integrated leak rate failure is not the failure of the ILRT test to measure containment leakage, nor does it indicate a failure of a Type A test to meet performance criteria of NEI 94-01. Rather, the term ILRT failure is used to describe those ILRT tests in which containment leakage was identified above the acceptance criteria that would not be detected by a

Local Leak Rate Test, containment inspection, or other alternate means, and is of sufficient size to potentially result in a large early release.

So, what that means is the portion of the test that may not be either covered by the Local Leak Test inspection, that is the portion that we are focusing on, that by not doing this test, you wouldn't identify.

MEMBER STETKAR: Antonio, since you have this nice equation --

MR. ZOULIS: Sure.

MEMBER STETKAR: -- if I go back -- and I didn't get a chance, unfortunately, to really study all of the details of the EPRI report; I have to apologize for that. I did read through it.

It seems like the EPRI report develops the delta assuming a linear relationship with the duration of the test interval. If I look at their results, and I scale from three in 10 years to once in 10 years, there is miraculously a factor of three difference. And if I, then, scale to once in 10 years to once in 15 years, there is a factor of 1.5 difference there.

Did anyone question the linearity in that assumption? That is a fundamental assumption. It says that the world behaves in a linear process.

For the purpose of this Type A test now, and I will go away from the other things that I was talking about, valve failure rates, which is also a question there, but in this, do we have any reason to believe that the world behaves linearly for the types of causes or failure modes that would contribute to these types of failures?

MR. ZOULIS: No, I don't think we question that. But I think because we consider the other factors, I mean like the defense-in-depth safety margin and all the other criteria, and we make gross assumptions on the size of the leak, all these things, we feel that we may be bounded by those other considerations.

MEMBER STETKAR: All right. The EPRI report talks an awful lot about the expert elicitation process that was also factors in for essentially undetectable or leakage that is not detectable by any of these other means. If I read through that process, they said they had six experts and they ran through a whole formal expert elicitation process about the likelihood of those types of failures as a function of leakage amount in terms of fraction of La.

They polled six experts and they threw out the high and the low because they said, well, the low

had a bunch of zeroes and they didn't know how to treat zeroes in their statistical methods. Because they threw out the low, they also threw out the high. That is not an appropriate way to treat uncertainties in expert elicitation. There are methods that treat zeroes, not the classical statistic methods that they used. Bayesian analysis treats zeroes perfectly fine.

My curiosity is, because they threw out those, the high and the low, you get this central-limit tendency of people who have looked at a limited set of data and draw conclusions. Do you have any idea how much difference including the high and the low would have made to those estimates? Because that is also something that influences this. You know, the risks-informed conclusion is what is the likelihood that this is the only test that can discover that type of leakage.

And then, the question is, how did the experts, then, account for the possibility -- they were presented the data, the historical data, but did they consider the possibility that there might be non-linear effects or something that just isn't a data-averaged-type phenomenon?

Because, unfortunately, in the EPRI report, once they threw out the high and the low, they

give me the results from the four that they kept. They don't tell me the results from the two that they threw out, so that I can even tell where they were. It might be something I missed, but I thought that is all that was there.

MR. ZOULIS: I don't have any information on that.

MEMBER STETKAR: Okay.

CHAIRMAN SHACK: But just in my simpleminded view, I mean, I assume the linearity comes back to the fact that you assume you have kind of random fit. So, if I increase the time interval, I increase the failure rate.

MEMBER STETKAR: Yes, but there is no time-dependent type of accelerating process.

CHAIRMAN SHACK: Now they do have a corrosion correction model that is the one mechanism one would sort of see as kind of a non --

MEMBER STETKAR: Yes.

CHAIRMAN SHACK: -- a non-constant thing. And so, they do attempt to --

MEMBER STETKAR: To handle that.

CHAIRMAN SHACK: -- handle that. I mean, I thought the factor of three was a lot better than the 10 percent that was in the original analysis.

MEMBER STETKAR: Well, yes. Yes.

(Laughter.)

CHAIRMAN SHACK: Now that one I couldn't figure out at all.

MR. ZOULIS: So, the population dose is calculated by multiplying the base population dose by the change of the probability of leakage event over the affected CDF end-states. And the conditional containment failure probability amounted to sequences where containment does not fail over the total CDF, and the difference in the percentage of the CDF where containment failure occurs.

So, their report considers the data that we were talking about. Over 217 tests conducted resulted in no ILRT failures; that there are different ways of detecting leakage pathways in the containment. These methods include the Local Leak Rate Test that we talked about before, reactor startup, normal operation, and other containment piping inspections.

We also spoke about the estimation of the containment leakage, of how they use 100 La. And the highest observed was about 21 La from past tests.

Of course, again, as Mr. Shack said, the liner corrosion model also is incorporated, which has a generic method for determining the change in

likelihood of detecting liner corrosion and the corresponding change in the risk due to the ILRT extension.

It also assumes that all non-detectable failures result in early releases. So, I mean, that approach is conservative and avoids a detailed analysis of containment failure timing and operator reactions.

MEMBER STETKAR: To come back to the LERF, though, the 100 La is a fairly large leak. If I look at the expert elicitation results, the four that I can look at, they were in the a couple times 10-to-the-minus-4 probability that that size of leak might exist and not be detected by any of these other cases.

If I fall back from LERF to smaller leaks, 5 to 10 La, there is an order of magnitude to an order-and-a-half of magnitude from the expert elicitation process that those types of leakage might be there, something in the middle to seven or eight times 10-to-the-minus-3 range.

Again, we are limited by this LERF in terms of the delta risk assessment for the purposes of the risk-informed regulations. I don't know how to deal with that.

MR. ZOULIS: For BWRs, since their

containment is nitrogen-inerted, then you should be okay detecting those kind. For the BWRs, we shouldn't have an issue with that.

MEMBER STETKAR: Right.

MR. ZOULIS: Now for the PWRs --

MEMBER STETKAR: In sub-atmospheric, there is, I don't know, two or three, I don't know how many sub-atmospheric PWRs, but a couple of those around. But for the large, dry PWRs, we don't have a lot.

MEMBER RAY: Don't have a lot of?

MEMBER STETKAR: Of other ways of determining that, indeed, the containment doesn't have an open pathway.

MEMBER RAY: Yes. No, I agree with you, John. I am sitting here just trying to focus on, well, what is the purpose of this thing to begin with, the containment leak rate test.

MEMBER STETKAR: It is to find those things, I think.

MEMBER RAY: Well, I do, too, but that doesn't seem to be where the agency is coming from. So, I am just trying to reconcile those things.

MR. ZOULIS: Next slide.

MEMBER STETKAR: I didn't get a chance to look at -- the data are in the report, and there are

tables and tables. The said that the highest observed leakage was 21. What was the cause of that? Do you know that event?

MR. ZOULIS: I read it, but I can't recall. I know they had trouble trying to find data that they could use, observable data, to come up with a rate. They even assumed in some cases it was the steam generator manway was open or some sort of -- it wasn't even really the containment. But, then, they used those values.

MEMBER STETKAR: Okay.

MR. ZOULIS: I read it, but I can't recall.

MEMBER STETKAR: Okay. And I should know, but, as I said, I think all the data are in the report. Your eyes glaze over after you read too many tables.

Okay. Thank you.

MR. ZOULIS: Next slide.

So, basically, the EPRI report has six steps of quantifying the risk. It has detailed methodology for each step, and it considers specific accident classes and uses those classes to calculate the risk impact to LERF and the population dose.

So, the licensee needs to basically

quantify the baseline. They start off from the three year to ten and then 15-year intervals. I have reviewed, I think, two applications, and they included the risk going from three to ten, and from ten to 15.

They developed a baseline population dose. They evaluated the risk impact for the interval extension changes, the impact to LERF and the change in the conditional containment failure probability. They do evaluate both internal and external events, and they perform a sensitivity analysis of the results. And they also consider the assumptions related to the liner corrosion analysis to evaluate that uncertainty.

So, it is pretty thorough. It has, again, detailed steps. It gives an example for PWR and BWR. So, it goes through both. I think Vogtle is the example for the PWR.

MEMBER STETKAR: Do those plant-specific analyses rely on this, on the expert elicitation results from the EPRI report on the probability distribution for the undetectable, if I call it that, leaks?

MR. ZOULIS: I think, yes, the plant-specific portion is the sensitivity LERF sequences and the CDF.

MEMBER STETKAR: But they essentially use the EPRI numbers?

MR. ZOULIS: Yes.

Next slide.

So, the final SE that was issued, which endorsed the NEI Technical Report and the EPRI document, was issued. You need again, license amendment request must be submitted for containment overpressure if it is relied upon for ECCS.

The PRA must meet Reg Guide 1.200 requirements for risk-informed submittal. And we found that the methodology supported the five key principles found in Reg Guide 1.174. So, we were satisfied that the risk associated with these changes was very small and was acceptable to grant the extension, permanent extension, to 15 years.

The conclusion, I think that basically the conclusions were that the intents of the Appendix J containment program ensures that the containment structure and the leakage integrity is maintained through its service life. We found the guidance to be acceptable for implementing Option B of 10 CFR 50, subject to the limitations and conditions in the NRC SER for Version 2, and the limitations and conditions for the NRC SER from Revision 3.

The staff finds the implementation around the risks associated with the interval extension acceptable and consistent with the five key principles of Reg Guide 1.174 and other risk-informed guides. The revision of Reg Guide 1.163 reflects the latest staff position based on Version 3A of the NEI Technical Report 94-01 guidelines. There are no new staff positions that are being promulgated in this revision.

And that concludes our presentation, I think, today, and we will probably open it up for questions, more questions.

MEMBER STETKAR: I guess this is not particularly a question. I have been dancing around it a bit, but it is more of my own thinking outloud a bit.

I think I understand fundamentally what has been done. I think a couple of my questions point to a bit of a concern about focusing only on LERF as the measure of merit for determining whether or not we can extend these and not also considering smaller isolation failures, which would, indeed, be detected, whether it is Type A or -- Type A I mostly concerned about testing.

We do have data and operating experience

from the current fleet. I will come back to my question about going forward with new reactors. I just don't know how much thought has been put into this notion of, for a new reactor, their performing two consecutive successful tests of a plant that has never operated before in the first four years of operation, and then being allowed to extend their test interval out to 15 years, with very little operating experience from that particular design.

Even if we accept the fact that valves are valves for the same valves, are there other mechanisms or causes that can affect that particular design? And I don't know. I just don't know. The containments are not radically-different containments, by and large, Harold's plant notwithstanding.

(Laughter.)

MEMBER RAY: No, that is right.

CHAIRMAN SHACK: Steel shell containment.

MEMBER STETKAR: Steel shell containment. So, one would not expect different failure mechanisms perhaps to derive.

MR. THOMAS: But Type A tests, you know, we have put a condition that states, for plants licensed under Part 52, applications requesting permanent extension of ILRT surveillance interval 15

years should be deferred until after construction and testing of the containments for that design have been completed and applicants have confirmed the applicability of NEI 94-01, Rev. 2, and EPRI report, Rev. 2, including the use of past containment ILRT data. So, there is a general condition for Type A tests.

MEMBER STETKAR: For Type A? So, they would have to come in with a justification about why the current operating fleet ILRT data applied to that particular design. Am I understanding that correctly?

MR. THOMAS: Correct.

MR. ZOULIS: I mean, it doesn't address the issue of the operating experience, the four years to --

MEMBER STETKAR: It doesn't address that directly, but it at least --

MR. ZOULIS: Makes sure that it is applicable.

MEMBER STETKAR: -- links or makes the applicant think about it and justify why data, that experience from the current operating fleet applies to their particular design and configuration. And it requires you to think about that, also, I guess, when they come in.

Okay. I will have to think about that a little bit. Thank you.

MEMBER RAY: Well, I have a similar kind of -- I spent time working for the meeting next door, not this one. So, I am having to think about this as we go along here.

But, be that as it may, I am still stuck on, what is the point of the test in the first place? Supposing -- just supposing, hypothetically -- that we always found there are a lot of leaks that shouldn't exist. I am leaving aside LERF and exposure of the public, and so on. But just if the test found that regularly -- and I am making this just a hypothetically -- that we identified small leaks as compared with ones that would challenge the risk-informed basis of the extension, but we are saying, well, that is okay because we can extend the test interval, notwithstanding that fact, because the point of the containment is just the limitation on risk to the public health and safety due a LERF event.

I don't think that is right. I don't think that is where we really believe we are when it comes to containment integrity. And yet, I understand the policy objective of risk-informed regulation and justifying things that we require on that basis. But

I am still uncomfortable with the idea that there are a lot of penetrations which, if they are found often to be leaking during a Type A, for example, that is not a good situation.

So, how do we deal with that?

CHAIRMAN SHACK: Well, I think you have it the other way around, Harold. I think this whole thing arose because, when you did the Type A tests, you found very few failures.

MEMBER RAY: But we don't have that data here, Bill. That is my point.

CHAIRMAN SHACK: Well, we know that we have the 217, or whatever it is, with no failures. Now that includes some that don't have the 15 years.

MEMBER RAY: Yes, exactly.

CHAIRMAN SHACK: But the whole Type A history is a good one. So, the question, then, becomes, okay, it really is a defense-in-depth thing. You really don't think you are going to have these small failures. You know, the failures are mostly Type B and Type C things, which you are inspecting on a much more frequent basis.

MEMBER RAY: Right.

CHAIRMAN SHACK: The risk-informed part sort of says, okay, am I really taking a big chance

here when I do that? Even though my data looked good, am I giving up too much in defense-in-depth? To me, that is where the risk-informed argument comes in that says, no, I am not really losing my defense-in-depth. If I am wrong, I still have got some --

MEMBER RAY: I agree with you, if you are looking at it just from the standpoint of test failure experience, Type A test failures. I understand. But, still, we are now not finding and addressing the other causes of leakage that you do when you conduct a Type A test.

Again, I am not criticizing the conclusions.

CHAIRMAN SHACK: But I think we have a very different discussion here if they had lots of failures in Type A tests.

MEMBER RAY: Yes, I concede that.

MEMBER STETKAR: I go back to this expert elicitation process for this, and correct me if I am wrong, please, because, as I said, I didn't have the time, a chance to really sit down and study this.

The expert elicitation looked at the experience, those however many leak rate tests that have been done, and said, given that experience, the experts were tasked were saying, as a function of

undetected leak size, the size of the leak that would not be detected by, for example, Type B and C testing, what is the likelihood, given that operating experience, what we have learned?

MR. ZOULIS: The other things, visual inspections and --

MEMBER STETKAR: The other things. What is the likelihood that that type of leak might exist, given the testing history that we have had? And the experts, again, with the caveat that they threw out the high and the low, I would really be interested in what the high looked like and what the shape of that expert distribution actually was.

But, given that caveat, the experts are saying that, for -- and I don't know what you call a modest leak -- twice the allowable leakage rate, they are assigning about a 1-percent probability that that might be there at any given time, which depending on your notion of large or small numbers, that is essentially what they are saying.

And I think, Harold, that process tried to capture that operating experience. So, you know, when you say you have a lot of tests that have small failures, the experts at least who had the opportunity to look at all of that data assessed that that happens

about once in 100 to once in 50 times or so. So, apparently, I am assuming that they didn't just wholesale throw out a lot of the actual failure experience data.

Now the question is whether that is something that we should be concerned about here because that certainly isn't a contributor to LERF.

MEMBER RAY: Yes.

MEMBER STETKAR: And it is something that has not, explicitly not been considered in -- I don't think, anyway -- in the EPRI analyses because they did look specifically at LERF.

MR. ZOULIS: They do look at potential containment failure probability and, also, the base dose to the population. So, they evaluate that as well. So, then, there are three figures that they valuate. It is not just LERF.

MEMBER STETKAR: Okay.

MEMBER RAY: Well, again, to speak to what Bill said, I agree with you, John, we look to other things, basically, than the Integrated Leak Rate Test to provide necessary confidence that we don't have unacceptable, but still small leaks in penetrations and isolation valves, and that sort of thing.

It is just that that means to me that the

Integrated Leak Rate Test has a limited, more limited role to play than --

MEMBER STETKAR: I think that is certainly true for large leaks.

MEMBER RAY: So, anyway, having made that point, I don't have anything else to offer, I guess.

CHAIRMAN SHACK: But, I mean, I am right that the IWE/IWL thing was actually brought into this, basically, to support the Appendix J kind of Option B thing, right? I mean, that is when IWE came into the code, wasn't it?

MR. THOMAS: Came into the regulation, yes, in 1995.

CHAIRMAN SHACK: Yes. 1995.

MR. THOMAS: About the same time as --

CHAIRMAN SHACK: So, I mean, that was another sort of defense-in-depth thing, is to add a large amount of at least visual inspection on a much more frequent basis. Again, it doesn't address everything, but it certainly helps.

I mean, if I can go back to Dennis' thing, you know --

MEMBER RAY: Trust me, you don't want to do these tests unnecessarily and for no reason.

CHAIRMAN SHACK: -- "Extensions of

surveillance intervals are made in stepwise fashion," such as equipment is tracked carefully in new failure modes. I mean, it seems to me, you know, they did the first extension to 60 months for the Type C. You looked at the data. It looks pretty good. I mean, the failure rates are low. There is no time-dependence. I mean, you are not seeing a history kind of accelerating thing.

And again, if we see a bunch of Type A failures here in the next couple of years, we can revisit this again. But, certainly, there are no trends that indicate a problem here.

It seems to me they are sort of following Dennis' notion of marching out here a little carefully.

MEMBER STETKAR: I am forgetting the acronyms here. So, I am trying to remember acronyms in real-time, but somebody will help me out.

And I will grant you that for the current operating fleet. But if I go to new plants, and something Antonio said earlier prompted another thought, new plants, for the passive plants, they have a list of equipment called RTNSS equipment on safety-related stuff. And for the active plants, they have what I think is a comparable list -- and I have

forgotten the acronym for that list, but it is the --

CHAIRMAN SHACK: DRAP.

MEMBER STETKAR: Thank you. DRAP, Design Reliability Assurance Program equipment list, which is analogous in my mind.

Those SSCs are assigned to those lists based on risk indices in many cases. There is an expert panel that looks at other non-numerical factors, but there is reasonable reliance on risk indices.

We have not worked our way through, I don't think, as an agency, about how that process will be applied in practice. Well, there are sort of templates, but if I ask people about how DRAP lists that are developed during the design certification transition to operational phases, because of differences in guidances about numerical criteria, I don't get warm feelings about how people will make that transition.

The reason I bring this up is that you mentioned something that said, well, we have had some experience about somebody mischaracterized a piece of equipment as low significance and, therefore, didn't do the types of surveillance on that equipment that would have been applied, had it been appropriately

characterized.

Is there a danger of doing that with the new designs? How carefully do we need to work through this process for the new designs? Because they are characterized, they are binning equipment based on risk-informed judgments. And will people be thinking about that characterization with regard to containment leak rate testing? Because a lot of that has been done primarily on core damage frequency, I will tell you. Very few detailed analyses. They have done some limited Level 2-type analyses, but not very much.

MR. ZOULIS: Are the new reactors required to have a Level 2 model or --

MEMBER STETKAR: They are. By the time of fuel load, they are, full-scope, all plant operating modes, Level 2 --

MR. ZOULIS: So, they should be better off --

MEMBER STETKAR: -- even out to considering Level 3 issues, but certainly Level 2. All internal/external initiating events.

MR. ZOULIS: They should be better off than the current fleet.

MEMBER STETKAR: At least in terms of characterizing the equipment, from that perspective,

as long --

MR. ZOULIS: I mean, I came from the Northeast before I came to the agency. We just ran through an AOV program. We did that. We looked at CDF, but we also evaluated the LERF contribution from the valves.

And then, as you mentioned, we did have an expert panel meeting where we sat down with the AOV engineer, the maintenance engineer, the systems engineers, the PRA, and discussed other qualitative aspects of whether or not these valves -- for each valve individually, that is, I believe, part of the AOV risk-ranking program.

Now the NRC's role in evaluating these programs, I am not sure.

MEMBER STETKAR: Yes.

MR. ZOULIS: I mean, I don't know. I am telling you from experience how we applied that.

Will you miss valves? Hopefully, you won't. I mean, the whole purpose of having an expert panel and having these reviews is not to miss them.

MEMBER STETKAR: One of the reasons I brought it up -- and I brought it up again thinking, Bill, about your comment from Dennis -- is that these extensions would be applied in a stepwise manner,

looking at the performance of the equipment. Well, for new plants, they won't be applied in a stepwise manner. A new plant could start operation today, and four years from today would be granted, presumably zero failures in those two tests, would be granted an extension to 15 years. That is not a stepwise approach. That is two attempts to find rare failures.

CHAIRMAN SHACK: But that does come back to how different you think the new plants are, and are the failure rates that we are applying to these plants applicable to the new plants.

MEMBER STETKAR: Right.

CHAIRMAN SHACK: As far as I can tell for the kinds of things we are talking about today, I can't think of differences.

MEMBER STETKAR: I can't think of differences, either, but --

CHAIRMAN SHACK: By and large, they are improvements. I mean, they have got better seals. I don't think we are going to get water running down into sand.

(Laughter.)

MEMBER STETKAR: But I will admit that, even on the design certifications, I haven't paid a lot of attention to the containment isolation valves

or isolation barriers.

CHAIRMAN SHACK: But I just can't believe they are inventing new valve types. But you are right. But, again, that does come down to looking at this applicability, which is somewhere in that license condition.

MEMBER STETKAR: I was going to say, that is a very, very important part of that justification for the Part 52.

MR. ZOULIS: Also, we mentioned before, when they develop their PRAs, they need to be Reg 1.200-compliant. So, they need to make sure that they are not using data that is not applicable to their population. And that should be peer-reviewed and make sure that it is done correctly and that they are evaluating that appropriately.

I mean, I can't see a peer review accepting generic data for a AOV valve to be applied to a new type valve that has no -- I mean, I don't know how they would accept that. It could happen, I guess. Anything is possible.

MEMBER RAY: Well, we just had a reactor vessel head problem, didn't we, somewhere? I think of the containment equipment hatch as being, for example, a huge potential leak path as a result of a problem

with a seal.

CHAIRMAN SHACK: I think of people cutting into containments under 50.59.

(Laughter.)

That has happened. People have found 2-inch holes open.

MEMBER RAY: Anyway, in the liner, I assume you are talking about, but --

CHAIRMAN SHACK: No, I mean, cutting big hatches for like a steam generator.

(Laughter.)

MEMBER RAY: Oh, oh, oh, yes. Well, no, I don't worry about --

CHAIRMAN SHACK: Then, we patch it up.

MEMBER RAY: No, I don't worry about those. I worry about the equipment hatch that you are moving in and out umpteen times between tests, between integrated tests.

CHAIRMAN SHACK: Oh, but the equipment hatch is treated differently.

MEMBER RAY: I know. You have got a double seal and you can test between the seals. I know. I understand that. But, nevertheless --

MR. THOMAS: Regarding the 24-month minimum interval, like Bill is speaking, licensees are

going to push that as far as possible.

CHAIRMAN SHACK: They want the 48 months, huh?

(Laughter.)

MEMBER STETKAR: Well, that is true unless they are forward-thinking and think that, by doing a couple of quick tests, they can get a lot of relief over the next 60 years or 80 years. You know, if they can forgo doing two or three or four tests over the life of the plant by doing a couple of quicker tests in the first four years of operation, they might decide to do that. They might.

CHAIRMAN SHACK: But, still, you take every month you can get, I would think.

MR. THOMAS: They are more likely to go more number of tests if they do it at smaller intervals.

CHAIRMAN SHACK: Smaller intervals, right.

MR. THOMAS: So, they have to do it, you know, to the maximum interval possible to get the minimum level.

MEMBER STETKAR: No, I am saying you do the first two tests quick, and by doing that, you save perhaps --

CHAIRMAN SHACK: But if I do the first two

tests slow, I still get 15 years.

MEMBER RAY: I thought what John was talking about was you do it when you think you can pass. The only incentive for doing them quick is to eliminate the risk of degradation.

MEMBER STETKAR: Right, any time-dependent, non-linear effects that --

MEMBER RAY: I agree with those who say that you would extend it out.

CHAIRMAN SHACK: But, I mean, in the first eight years I am not looking forward, you know -- man, if I think my containment is going to degrade my first eight years, I have got bigger problems than passing my Type A test.

(Laughter.)

MEMBER RAY: I agree.

MR. THOMAS: That is the reason we went with the 15-year interval. They have been trying to push it a few months further.

MEMBER STETKAR: I think, in practice, you are probably right. I am trying to play devil's advocate here about how people might try to game the system, if they think they might save something over 60 years.

MEMBER RAY: But that would only be

because you reduce the risk of a failure as a result of doing them quickly.

MEMBER STETKAR: That's right. Get them out of the way quick, when you have high confidence that you won't have any failures, and then reap the benefits that way.

I don't have anything more, Bill.

CHAIRMAN SHACK: No further comments?

(Laughter.)

I won't even ask if there is anybody on the phone line today, I don't think.

Do we see a need to bring this to the full Committee?

MEMBER STETKAR: I have been trying to think about that.

CHAIRMAN SHACK: Outside of the interest we have in some members who are not here today --

MEMBER STETKAR: I mean, that would be the only reason, is because of the limited attendance of the Subcommittee.

MEMBER RAY: Well, there was so much background that, if we do it, I would suggest we just talk about what difference does the revised Reg Guide make, not what is the long, long history. Although it is informative for this meeting, I think the issue

that might --

CHAIRMAN SHACK: Yes, but without looking at the history, I am not sure that you can make a judgment on the reg. Dennis' whole concern is, have we been going at this in kind of a stepwise, incremental fashion? I think the history says yes. And if we take the history out, then the question arises, are we, you know --

MEMBER RAY: Yes.

MEMBER STETKAR: And I agree for the operating plants. I think that, for the new plants, that second bullet that is on the slide that we have here has to be the critical element, that those plants need to very clearly justify why the experience from the current fleet, not filtered, not screened, not disposed of otherwise, is applicable for their particular containment design and their particular systems.

And in particular, I will give you the valves. I will come back to this expert elicitation, because I look at the Type A test as the test that ultimately discovers the things that you haven't thought about in any of your other testing. And I think that was the purpose of that expert elicitation and to understand, right?

CHAIRMAN SHACK: But I look at the purpose of the expert elicitation to meet the numbers in 1.174.

MEMBER STETKAR: Well, but it is a risk-informed application.

CHAIRMAN SHACK: I know, but if I go back to 1493, which I look at the real defense-in-depth argument, I find that to me much more convincing in a defense-in-depth fashion than I do the expert elicitation to give me the numbers, which I admit I need for 1.174. But if I am sitting here asking myself, am I really risking my defense-in-depth, I got back to the 1493 analysis, which I like those sensitivity studies to give me that defense-in-depth feeling much more than I do an expert elicitation that I need because I need a number. I mean, that gets me "risk-basey".

And if I put uncertainties in all this, you know, we would be somewhere, but, again, I get a lot of confidence out of the 1493 kind of arguments.

MEMBER STETKAR: What about, Bill -- I am trying to think of other issues that --

CHAIRMAN SHACK: That might come up?

MEMBER STETKAR: That might come up. This notion of small leaks, the risk-informed justification

being key primarily to large early release versus higher frequency of undetected small release paths.

CHAIRMAN SHACK: But I think that was looked at in the 1493 kind of analysis where they looked at the sensitivity analysis there. You know, they looked at basically small leaks up to pretty large leaks, then the containment bypass and failure.

MR. ZOULIS: I mean, 1493 was very detailed. There was a lot of information in that really.

CHAIRMAN SHACK: I mean, that is a true risk-insight kind of a document that sometimes we lose when we get to the formalism of having to demonstrate numbers.

MR. ZOULIS: I mean, the EPRI methodology is more of an application of that information. How do you use it if you are coming for license submittal? But the whole basis was 1493.

MR. RICHARDS: You have asked us for some additional information on how many containments have been tested after, roughly, 15 years. Will that impact your thinking as far as taking it to the full Committee?

MEMBER RAY: I think the 10-year data is in that database, the same database, right?

CHAIRMAN SHACK: Yes, but we were specifically looking at the 15-year kind of --

MEMBER STETKAR: Yes, I am interested in that. I don't think it would affect my decision about taking it to the full Committee. I think the full Committee is sort of broader issues than that.

CHAIRMAN SHACK: We would certainly like to know that information.

MEMBER STETKAR: We would like to see that because it was highlighted as a point here to kind of support the notion of extending the --

MEMBER RAY: Are you just talking about those that have gone out as far as 15 years? Or aren't you talking about everything that has gone beyond, that is extended as a result of the earlier extension before?

MEMBER STETKAR: No, just the --

MEMBER RAY: Not the 217, though?

MEMBER STETKAR: No, just the --

CHAIRMAN SHACK: That fraction that is based on the 15 years.

MEMBER STETKAR: On the 15 years, the ones that have either gotten a one-time extension and the extended testing under that extension, or you said three plants have been approved for 15 years; I doubt

any of those have done it, but maybe they have. How many of those? You know, this notion of, well, we haven't had any failures, is it zero out of --

CHAIRMAN SHACK: There has got to be a fair number of tests between now and 2015.

MEMBER STETKAR: You would think that a bunch would be coming in, wouldn't you?

CHAIRMAN SHACK: Coming in.

MEMBER STETKAR: I don't know.

CHAIRMAN SHACK: But, as you say, my guess is, if they can put it off until 2015, it is going to be 2015.

(Laughter.)

MEMBER STETKAR: You know what we may want to do, Bill, is I am kind of on the cusp here. I don't think we need to go to the full Committee, but I think we should probably summarize the results of this Subcommittee meeting at our October full Committee meeting --

CHAIRMAN SHACK: That is a fair-enough statement.

MEMBER STETKAR: -- and see whether any of the members, given our summary --

CHAIRMAN SHACK: Want to come back.

MEMBER STETKAR: -- want to come back and

revisit it. So, that is not a clear answer yet, but you will have one in two weeks.

CHAIRMAN SHACK: Harold, is that acceptable to you?

MEMBER RAY: Yes.

CHAIRMAN SHACK: That seems to be reasonable.

MEMBER STETKAR: I think that sounds best.

MR. ZOULIS: Was there anything that we could provide that may help you? I mean, I know we gave you the SE, had some information in the EPRI report. Is there anything else that maybe might -- I am sure you have NUREG-1493.

MR. NGUYEN: That was limited to the SharePoint workspace because it is 300-some pages.

MEMBER STETKAR: No, I think we have got all the --

CHAIRMAN SHACK: Except for the data on the tests that is coming up, but I think we have all the supporting information that we need.

MEMBER RAY: Okay?

CHAIRMAN SHACK: Okay. I think we can adjourn then.

We will leave it, essentially, as it is. We won't have anything at the October meeting, and we

will make a final decision as to whether we will have a full Committee presentation at that time. I think the inclination from the Subcommittee, as you have heard, is not, but we may get some pushback from our members.

MR. RICHARDS: Thank you.

CHAIRMAN SHACK: Thank you.

(Whereupon, at 10:27 a.m., the meeting was adjourned.)

U.S.NRC

United States Nuclear Regulatory Commission

Protecting People and the Environment

Regulatory Guide 1.163
Performance-Based Containment Leak-Test Program

ACRS Subcommittee Meeting
September 18, 2012

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Regulatory Guide 1.163

Objective

- The objective of this briefing is to provide ACRS subcommittee an overview of RG 1.163, NEI guidance for implementing the performance based leak test program and the staff evaluation of the risk assessment of extending integrated leak rate testing intervals.

Regulatory Guide 1.163

Outline

- Background
- Overview of NEI 94-01
- Risk Assessment (EPRI Report 1009325)
- Conclusion

Regulatory Guide 1.163

Background

- 10 CFR Part 50, Appendix J specifies containment leakage testing requirements : Option A (Prescriptive) & Option B (Performance-Based)
  - Type A Test: Integrated leakage rate tests (ILRTs)
  - Type B Test: Leakage tests of penetration seals, gaskets, and expansion bellows
  - Type C Test: Leakage tests of containment isolation valves
- Option B “Performance-Based Requirements” in Appendix J was issued in 1995. Option B allowed licensees to voluntarily replace existing Option A Appendix J prescriptive testing requirements with testing requirements based on leakage rate performance, and a supporting plant-specific risk impact assessment.

Regulatory Guide 1.163

Background

- NUREG-1493 (1995) "Performance-Based Containment Leak-Test Program" and EPRI TR 104285 "Risk Impact Assessment of Revised Containment Leak Rate Testing Intervals" provided the technical bases for NRC's 1995 rulemaking (60 FR 49495) that added an Option B to Appendix J.

- The FR notice supplementary information describes the NRC staff's rationale for settling on the 10-year interval for ILRT and 5-year interval for Type C LLRT as "…a cautious, evolutionary approach as data are compiled to minimize the uncertainty….a prudent first step."

Regulatory Guide 1.163

Background

- The Nuclear Energy Institute (NEI) issued Topical Report 94-01, Revision 0, “Industry Guideline for Implementing Performance-Based Option of 10 CFR Part 50, Appendix J” in 1995.

- Regulatory Guide (RG) 1.163, “Performance-Based Containment Leak-Test Program”, was issued in 1995 which endorsed NEI 94-01, Revision 0, with limitations and conditions.

- Appendix J, Option B, requires that the implementing document (RG or other) used by a licensee to develop a performance-based leakage-testing program must be included by reference in the plant Technical Specifications.

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Background

- In August 2007, NEI issued revision 2 to TR 94-01 which included provisions for extending the performance based ILRT interval to 15 years and incorporated the regulatory positions in RG 1.163. The risk impact assessment of extended ILRT intervals was provided in EPRI Report 1009325.

- The NRC staff issued safety evaluation approving NEI 94-01 Rev 2 and EPRI Report 1009325 Rev 2 with conditions and limitations in June 2008. NEI 94–01, Rev 2-A, was issued October 2008 by NEI.

- DG 1220 (RG 1.163 Rev 1) was developed to endorse NEI TR 94-01, Rev 2-A subject to limitations and conditions provided in the NRC Safety Evaluation.

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Background

- Subsequent to issuance of DG 1220, NEI submitted revision 3 to NEI TR 94-01 in June 2011 which included guidance for extending Type C local leak rate test (LLRT) interval from 60 months to 75 months.

- The NRC staff issued safety evaluation approving NEI 94-01 Rev 3 with conditions and limitations in June 2012. NEI 94–01, Rev 3-A, was issued July 2012 by NEI.

- DG 1220 (RG 1.163 Rev 1) will be updated to endorse NEI TR 94-01, Rev 3-A subject to limitations and conditions provided in the NRC Safety Evaluations for Rev 2 and Rev 3.

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NEI 94-01, Rev 3A

- Delineates a performance-based approach for determining Type A, Type B, and Type C containment leakage rate testing frequencies. Justification for extending intervals is based on performance history and risk insights.
- Includes guidance for extending performance-based Type A ILRT intervals up to 15 years and Type C test intervals up to 75 months. Also, incorporated regulatory positions in RG 1.163 (1995).
- Specific details of the testing methodology and requirements are contained in ANSI/ANS 56.8-2002.

Performance-Based Type A (ILRT) Tests

- Type A Test intervals can be extended from the initial 48 months up to a maximum of 15 years based on acceptable performance history and a supporting plant-specific confirmatory risk impact assessment establishing the risk impact is small.
- Acceptable performance history is defined as successful completion of two consecutive periodic Type A tests where the calculated performance leakage rate was less than 1.0 La
- A Type A test failure requires corrective action followed by a successful Type A test prior to going operational. Another successful periodic test must be completed within 48 months to reestablish performance before the test interval can be again extended to 15 years
- Pretest and supplemental visual inspection requirements to provide continuing supplemental means of identifying potential containment degradation

Performance-Based Type A (ILRT) Tests

- Appendix J - Option B, requires that a general visual inspection of accessible interior and exterior containment surfaces for structural deterioration that may affect leak-tight integrity must be conducted prior to each Type A test and at a periodic interval between tests. NEI 94-01, Rev 3-A specifies:
  - General visual examinations of accessible interior and exterior surfaces of the containment must be conducted prior to each Type A test; and during at least three other outages before the next Type A test if the Type A test interval has been extended to 15 years
  - To avoid duplication or omissions, NEI 94-01 recommends that these visual examinations be performed in conjunction or coordinated with the ASME Code, Section XI, Subsections IWE/IWL examinations required by 10 CFR 50.55a
  - Deficiencies identified are entered into the plant's corrective action program to determine cause and appropriate corrective actions

Containment In-Service Inspection Program

- 10 CFR 50.55a Containment In-Service Inspection (ISI) Program
  - Mandates ISI of Class MC (steel) and Class CC (concrete) containment pressure-retaining surfaces to be performed in accordance with applicable editions/addenda of the ASME Code, Section XI, Subsection IWE and Subsection IWL, respectively, subject to regulatory conditions
  - Subsection IWE requires general visual examinations of 100 percent of accessible Class MC containment pressure retaining surfaces and metallic liners of Class CC containments to be performed 3 times during a 10-year ISI interval (i.e., at least 4 examinations over a 15-year ILRT interval)
  - Subsection IWL requires general visual examination of accessible Class CC concrete pressure-retaining surfaces to be performed every 5 years (i.e., 3 examinations over a 15-year ILRT interval)
  - Suspect areas are subject to detailed/augmented examination and evaluation

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Limitations and Conditions

- Limitations and Conditions (for extending Type A test intervals up to 15 years - NRC SER for Rev 2-A)
  - For calculating the Type A leakage rate, the licensee should use the definition in the NEI TR 94-01, Revision 2, in lieu of that in ANSI/ANS 56.8-2002
  - The licensee submits a schedule of containment inspections to be performed prior to and between Type A tests
  - The licensee addresses the areas of the containment structure potentially subjected to degradation
  - The licensee addresses any tests and inspections performed following major modifications to the containment structure, as applicable

Limitations and Conditions

- Limitations and Conditions (for extending Type A test intervals up to 15 years - NRC SER for Rev 2-A) (cont…)
  - The normal Type A test interval should be less than 15 years. If the licensee has to utilize the provision of Section 9.1 of NEI TR 94-01, Revision 2, related to extending the ILRT interval beyond 15 years, the licensee must demonstrate to the NRC staff that it is an unforeseen emergent condition. (The NRC issued RIS 2008-27 to clarify this position)
  - For plants licensed under 10 CFR Part 52, applications requesting a permanent extension of the ILRT surveillance interval to 15 years should be deferred until after the construction and testing of containments for that design have been completed and applicants have confirmed the applicability of NEI TR 94-01, Revision 2, and EPRI Report No. 1009325, Revision 2, including the use of past containment ILRT data

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Operating Experience

- Extension Requests
  - Many licensees requested and received approval for one-time 5-year extensions to the 10-year performance-based interval requirement for ILRT performance in RG 1.163 (1995)
  - Three plants have received approval for extension of the performance-based ILRT interval to 15 years, based on adopting TR NEI 94-01, Rev 2-A, as the implementing document

- Operating experience related to containment testing and inspections
  - There has been no reported Type A test failures as a result of extended testing frequencies to 15 years

Performance-Based Type B & C Tests

- Test intervals may be increased from 30 months up to a maximum of 120 months for Type B tests (except for containment airlocks) and up to a maximum of 75 months for Type C tests
- Extensions of Type B and Type C test intervals are allowed based upon completion of two consecutive periodic as-found tests where the results of each test are within a licensee's allowable administrative limit
- Administrative limits for leakage rates shall be established, documented, and maintained for each Type B and Type C component prior to the performance of LLRT in accordance with the guidance provided in ANSI/ANS-56.8-2002
- A failure is defined as a valve exceeding its administrative leakage limit

Performance-Based Types B & C Tests

- NEI collected data for leak-tight performance of Type C containment isolation valves on extended intervals and presented them in EPRI Report No. 1022599, “Type C Containment Isolation Valve Performance”
- This report validates the risk impact assessment of EPRI TR-104285 for Type C containment isolation valve extended intervals and further shows that the leak-tight performance of Type C containment isolation valves tested on extended intervals after 1995 is significantly better than the leak-tight performance of the general population of Type C valves tested before 1995

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Performance-Based Types B & C Tests

- The combined leakage rate for all penetrations and valves subject to Type B and Type C tests shall be less than 0.60 La
- Section 12.1, “Report Requirements” was revised to require that the post-outage report shall include the margin between the Type B and Type C leakage rate summation and its regulatory limit
- Any adverse trends in the Type B and Type C leakage rate summation shall be identified in the report and a corrective action plan developed to restore the margin to an acceptable level

Limitations and Conditions

- Limitations and Conditions (for extending Type C test intervals up to 75 months - NRC SER for Rev 3-A)
  - Extensions of up to nine months (total maximum interval of 84 months for Type C tests) are permissible only for non-routine emergent conditions. At no time shall an extension be allowed for Type C valves that are restricted categorically (e.g. BWR MSIVs), and those valves with a history of leakage, or any valves held to either a less than maximum interval or to the base refueling cycle interval
  - When routinely scheduling any LLRT valve interval beyond 60-months and up to 75-months, the primary containment leakage rate testing program trending or monitoring must include an estimate of the amount of understatement in the Type B and Type C total, and must be included in a licensee's outage report. The report must include the reasoning and determination of the acceptability of the extension, demonstrating that the LLRT totals calculated represent the actual leakage potential of the penetrations

NEI 94-01 Summary

- The major difference between NEI TR 94-01, Revision 0 and Revision 2A is Revision 2A includes provisions for extending Type A test intervals up to 15 years.

- The major difference between NEI TR 94-01, Revision 2A and Revision 3A is Revision 3A added guidance for extending Type C tests from 60 months to 75 months.

- The 10 CFR 50, Appendix J, Containment Leakage Testing Program (consisting of ILRTs, LLRTs) and the 10 CFR 50.55a Containment In-Service Inspection (CISI) Program (in accordance with ASME Section XI, Subsections IWE/IWL) together ensure that containment structural and leakage integrity is maintained through its service life.

Risk-Informed Regulation

- A philosophy whereby risk insights are considered together with other factors* to establish requirements that better focus licensee and regulatory attention on design and operational issues commensurate with their importance to health and safety

- NRC approach is not "*risk-based*"

* e.g., traditional engineering approaches

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Risk Assessment – Principles of R.G. 1.174

Key Principles

2. Change is consistent with defense-in-depth philosophy.

1. Change meets current regulations unless it is explicitly related to an exemption or rule change.

INTEGRATED DECISIONMAKING

3. Maintain sufficient safety margins.

5. Use performance-measurement strategies to monitor the change.

4. Proposed increases to CDF or risk are small and are consistent with the Commission's Safety Goal Policy Statement.

EPRI Report: Risk Impact Assessment of Extended ILRT Intervals

- EPRI report demonstrates conclusions developed in NUREG-1493 are still valid.
  - NUREG-1493 states, “Reducing the frequency of Type A tests (ILRTs) from the current three per 10 years to one per 20 years was found to lead to imperceptible increase in risk.”
- Utilizes the principles of risk-informed regulation and integrated decision-making illustrated above

EPRI Report (Cont.)

- CDF is not significantly impacted by an extension of the ILRT interval. Plants that rely on containment overpressure for net positive suction head (NPSH) for emergency core coolant system (ECCS) injection for certain accident sequences may experience an increase in CDF (This impact is evaluated in the risk assessment)

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EPRI Report (Cont.)

- LERF is the figure of merit for evaluating the risk of the interval extensions
- In addition to LERF, EPRI risk assessment takes into consideration 2 additional metrics:
  - increase in population dose (expressed both as person-rem/year and percent increase above the total base dose)
  - increase in conditional containment failure probability (CCFP) (expressed as percentage points)

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EPRI Report (Cont.)

Δ LERF = Δ ILRT Failure Probability X CDF

Δ Population Dose = Δ ILRT Failure Probability X Population Dose

CCFP = 1 – (Intact CDF / Total CDF)

EPRI Report (Cont.)

- Key Considerations:
  - **Data.** Over 217 tests conducted resulted in no ILRT failures
  - **Alternate means of detection.** Various alternative methods of detecting a leakage pathway in containment exist. These methods include local leak rate tests (LLRTs), reactor startup, normal operation, and other containment and piping inspections.
  - **Estimation of containment leakage.** The use of 100 La is very conservative and leakage of this size has never been observed from empirical data. Highest observed was 21 La.
  - **Liner Corrosion.** Generic method for determining the change in likelihood of detecting liner corrosion and corresponding change in risk due to the ILRT extension is provided.

EPRI Report (Cont.)

- 6 Steps:
  1. Quantify the baseline (three-year ILRT frequency) risk in terms of frequency per reactor year for the EPRI accident classes of interest.
  2. Develop the baseline population dose (person-rem, from the plant PRA or IPE, or calculated based on leakage) for the applicable accident classes.
  3. Evaluate the risk impact (in terms of population dose rate and percentile change in population dose rate) for the interval extension cases.
  4. Determine the risk impact in terms of the change in LERF and the change in CCFP.
  5. Consider both internal and external events.
  6. Evaluate the sensitivity of the results to assumptions in the liner corrosion analysis

EPRI Report (Cont.)

- Final SE for NEI TR 94-01, Rev 2, "Industry Guideline For Implementing Performance-Based Option Of 10 CFR Part 50, Appendix J" & EPRI Report No. 1009325, Rev 2, August 2007, "Risk Impact Assessment of Extended ILRT Intervals" (ML081140105)
  - License amendment request must be submitted if containment over-pressure is relied upon by ECCs
  - PRA must meet Regulatory Guide (RG) 1.200 Requirements for risk-informed submittals
  - 5 Key principles of RG 1.174 are met

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Conclusion

- The 10 CFR 50, Appendix J, Containment Leakage Testing Program (consisting of ILRTs, LLRTs) and the 10 CFR 50.55a Containment In-Service Inspection (CISI) Program (in accordance with ASME Section XI, Subsections IWE/IWL) together ensure that containment structural and leakage integrity is maintained through its service life.

- The NRC staff finds the guidance in TR NEI 94-01, Revision 3-A, acceptable for referencing for implementing Option B of 10 CFR 50, subject to the limitations and conditions in NRC SER for Rev 2 (for extending Type A test intervals up to 15 years) and the limitations and conditions in NRC SER for Rev 3 (for extending Type C test intervals up to 75 months).

- The staff finds the EPRI methodology of evaluating the risk associated with the interval extensions acceptable and consistent with the 5 Key principles of RG 1.174.

- This revision of RG 1.163 reflects the latest staff positions based on Revision 3-A of the NEI TR 94-01 guideline. There are no new staff positions that are being promulgated in this revision.