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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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602nd MEETING

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS (ACRS)

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THURSDAY,

MARCH 7, 2013

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ROCKVILLE, MARYLAND

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The Advisory Committee met at the Nuclear Regulatory Commission, Two White Flint North, Room T2B3, 11545 Rockville Pike, at 1:00 p.m., J. SAM ARMIJO, Chairman, presiding.

MEMBERS PRESENT:

J. SAM ARMIJO, Chairman

JOHN W. STETKAR, Vice Chairman

HAROLD B. RAY, Member-at-Large

SANJOY BANERJEE

DENNIS C. BLEY

CHARLES H. BROWN, JR.

MICHAEL CORRADINI

JOY REMPE

MICHAEL T. RYAN

MEMBERS PRESENT (Continued):

STEPHEN P. SCHULTZ

WILLIAM J. SHACK

GORDON R. SKILLMAN

NRC STAFF PRESENT:

QUYNH NGUYEN, Designated Federal Official

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

(1:01 p.m.)

1) OPENING REMARKS BY THE ACRS CHAIRMAN

CHAIRMAN ARMIJO: Good afternoon. The meeting will now come to order. This is the first day of the 602nd meeting of the Advisory Committee on Reactor Safeguards.

VICE CHAIRMAN STETKAR: We don't have a quorum.

CHAIRMAN ARMIJO: Yes, we do.

VICE CHAIRMAN STETKAR: I'm sorry?

CHAIRMAN ARMIJO: You're right. One, two, three, four, five, six. Well, that's a dilemma. Let's try again.

MEMBER BLEY: There are two right next door.

CHAIRMAN ARMIJO: Okay. Let's drag them in here. Okay. As I said before, this is the first day of the 602nd meeting of the Advisory Committee on Reactor Safeguards. During today's meeting, the Committee will consider the following: one, proposed draft revision 1 to regulatory guide 1.163, "Performance-Based Containment Leak-Test Program"; two, future ACRS activities and a report of the Planning and Procedures Subcommittee; three,

reconciliation of ACRS comments and recommendations; and, four, preparation of ACRS report.

The meeting is being conducted in accordance with the provisions of the Federal Advisory Committee Act. Mr. Quynh Nguyen is the designated federal official for the initial portion of the meeting.

We have received no written comments or requests to make oral statements from members of the public regarding today's sessions.

There will be a phone bridge line. To preclude interruption of the meeting, the phone will be placed on a listen-in mode during the presentations and Committee discussion.

A transcript of portions of the meeting is being kept. And it is requested that the speakers use one of the microphones, identify themselves, and speak with sufficient clarity and volume so that they can be readily heard.

At this time, I would like to turn over the meeting to Dr. Shack, who will lead us through the first topic.

2) PROPOSED DRAFT FINAL REVISION 1 TO REGULATORY GUIDE (RG) 1.163, "PERFORMANCE-BASED CONTAINMENT LEAK-TEST PROGRAM"

2.1) REMARKS BY THE SUBCOMMITTEE CHAIRMAN

MEMBER SHACK: Okay. When the containment testing program was introduced, I guess, in the '80s sometime, it was basically on a deterministic basis. And you had to do the Type A integrated leak test three times in ten years.

I think I was the only member of the Committee who was here when the performance-based was introduced in the mid '90s. And that allowed an extension of the testing interval for the Type A test after ten years. And that was based on essentially a performance-based thing that you showed good performance in your two subsequent tests and a risk basis argument that said design basis leakage, even a small increase. So the kind of increases that you could expect under these extended intervals really had very little risk significance.

So that brought in the tenure increase in intervals. Licensees apparently who came after the ten-year intervals have been asking for that to be stretched to 15. The staff has received a document from NEI making the case for that. And they have been approving that on a case-by-case basis. And now we have a new reg guide that will essentially do away with the case-by-case consideration. And if the

licensee sets up an approved program, again with appropriate performance measures and a demonstration that for their plant, there is no risk significance to these extended intervals, they will be able to do this under their own without having to come in for approval every time they want an extended interval.

I think that is the basic idea of the revised reg guide. And I'll turn it over to Mr. Lin to make the presentation.

MR. LIN: Good afternoon. Thank you, Dr. Shack.

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

MR. LIN: Thank you for inviting us to brief you on the proposed revision 1 to reg guide 1.163. I'm Bruce Lin. I work at Research, Division of Engineering. With me are George Thomas, NRR, Division of Engineering; Brian Lee, NRR, Division of Safety Systems; Antonios Zoulis, NRR, Division of Risk Assessments.

This is an outline of what we are going to talk about today. I will briefly go over the background and why we are updating the reg guide and the proposed change in reg guide 1.163. And then George is going to talk about the performance-based

Type A tests. And Brian will cover the performance-based Types B and C tests. And then Antonio will talk about the risk assessments associated with interval extensions. I'll talk about the testing in the next slide.

The containment leakage test requirements are specified in the 10 CFR Part 50, appendix J. The two options, option A is prescriptive and option B is performance-based.

There are three types of tests that are required. Type A test is also called integrated leakage rate tests. Basically, Type A tests measure the overall leakage of the primary containment. Type B and Type C tests are also called local leakage rate tests. Type B tests are intended to measure the leakage for containment penetrations. And the Type C tests are intended to measure the leakage for containment isolation valves.

As Dr. Shack mentioned, option B was issued in 1995. Basically, option B allowed licensees to replace the existing option A testing requirements with requirements based on performance and supporting risk assessments.

The technical basis for the rulemaking in 1995 that added option B was provided in NUREG-1493.

Now, also in 1995, NEI issued a topical report, 94-01, which provides the industry guidelines for implementing the performance-based option of appendix J.

This topical report basically provides a performance-based approach for determining Type A, Type B, and Type C testing frequencies. And justification for extending the intervals is based on performance history and risk insights.

And the specific details of the testing are contained in ANSI/ANS 56.8. In October 2008, NEI issued revision 2-A to NEI topical report 94-01, which included provisions for extending the performance-based ILRT intervals to 15 years.

Then in July 2012, NEI issued another revision to the topical report, which included guidance for extending Type C further LLRT intervals from 60 months to 75 months. Those two revisions have been approved by NRC.

Also in 1995, NEI issued reg guide 1.163, which endorsed NEI 94-01, revision 0, with limitations and conditions. The proposed revision 1 to reg guide 1.163 will endorse NEI 94-01, revision 3-A subject to the limitations and conditions provided in the NRC safety evaluations.

Now, this revision of the reg guide basically reflects the staff positions based on revision 3-A of the NEI TR. There are no new staff positions promulgated in these new revisions.

I am going to turn it over to George to discuss the performance Type A tests.

MR. THOMAS: Thank you, Lin.

I am George Thomas. Good afternoon, members. I am going to now give you an overview of the topical report 94-01 2-A as well as 3-A, provisions specifically with regard to Type A tests, or integrated leak rate tests. I also will talk a little bit about the visual examination requirements. And then Brian Lee will follow with Type B and Type C tests. And Antonios will talk about the risk aspects.

Now, for the new plant, NEI 94-01 requires successful pre-operational Type A tests or prior to the start of initial operations. Following that, the initial interval is a maximum amount of 48 months and a minimum of 24 months.

Now, Type A test intervals can then be extended from the initial 48 months to a maximum of up to 15 years based on an acceptable performance history and a supporting plant-specific confirmatory risk assessment to establish that the risk impact is small.

Now, acceptable --

MEMBER SKILLMAN: Could you explain, please, what one might find in a confirmatory risk impact assessment?

MR. THOMAS: Antonios will be talking about that --

MEMBER SKILLMAN: Okay.

MR. THOMAS: -- later in the presentation.

MEMBER SKILLMAN: Right. I am just curious what that really means after the 48 months, after the 2-year, 3, 18-month. Whatever it is, I would like to understand what that is.

MR. THOMAS: Basically it evaluates the risk associated with increasing the interval from 48 months to 15 years.

MEMBER SKILLMAN: I understand the words, but I don't really understand the practical implication of that. Maybe we can talk about that later.

MR. THOMAS: Yes.

MEMBER SKILLMAN: Okay.

MR. THOMAS: Now, acceptable performance history is defined as successful completion of two consecutive periodic Type A tests where the calculated performance indicated is less than 1.0 times La. La

is defined as the maximum allowable leakage rate and the test pressure Pa and an expressant error rate for 24 hours.

La is specified in the tech spec. And Pa corresponds. There is the calculated containment internal pressure related to the design basis loss-of-coolant accident, which is also specified in the tech spec.

A periodic Type A test failure would require the cost to be determined and corrective action. And then the test will be followed by a successful Type A test while it was even in operation.

CHAIRMAN ARMIJO: Could you tell me, what are the units for the La?

MR. THOMAS: It is percent La per day, --

CHAIRMAN ARMIJO: Okay.

MR. THOMAS: -- for 24 hours.

Any periodic Type A test failure would require the cost to be determined and corrective action performed and then followed by a successful Type A test by resuming operation.

Another --

MEMBER SHACK: Excuse me. Just as a practical -- I realize that the pressure has to be the peak LOCA pressure. That's sort of the requirement.

Do most of the nationally designed do it at the design pressure just so they don't have to worry about what happens if they do some calculation, it changes to peak LOCA or do they actually use the peak LOCA?

MR. THOMAS: You know, they do between .96 times the peak LOCA and 1.1 times. That's the typical pressure.

MEMBER SHACK: Okay. We try to get the, pretty close to the design pressure.

MR. THOMAS: During the initial pre-operational tests, they will typically do it concurrently with the --

MEMBER SHACK: Suppose somebody did a test at a pressure and then came in and he made some change to his plant and recomputed his peak LOCA pressure and it had gone up by half a psi. What does he do then?

MR. THOMAS: Well, I mean, it doesn't change. If it's a small --

MEMBER SHACK: It's a small change. We're in a regulatory world now, where small doesn't exist.

MR. THOMAS: It's a small change. So that wouldn't affect it.

MEMBER SHACK: It doesn't affect it. Okay.

MEMBER REMPE: How often do they see

failures in the tests? And what is the typical reason for it?

MR. THOMAS: Very rarely and also the time the leakages through the penetrations.

MEMBER REMPE: What do they do to fix that, then? Do they seal the penetration better or something?

MR. THOMAS: Yes. They will seal it better and determine that a leakage is occurring.

MEMBER SKILLMAN: Redo the test. Fix it and redo.

MEMBER REMPE: Yes. I knew they would have to redo, but I just was curious as to what the normal failure modes were and the sealant. Okay.

MR. THOMAS: Now, another successful periodic Type A test must be completed within 48 months in order to reestablish performance and extended it to again 15 years. The topical report also specifies pretests and supplemental visual examination requirements to provide continuing supplemental means of identifying potential containment degradation that would affect structural leak tight integrity.

VICE CHAIRMAN STETKAR: George, in that third bullet, the second one that they have to

perform, I mean, you know, by definition, their first one will be successful once they fix the holes. So all you require is one more successful one before you can go back to 15. Is that correct? Rather than having two randomly performed successful tests, it is a test that is guaranteed to be successful with the next one successful?

MR. THOMAS: Are you talking in case there is a failure?

VICE CHAIRMAN STETKAR: Yes, in that third bullet there.

MR. THOMAS: The failure, they would fix it and reperform the test.

MEMBER SHACK: And they reperform it until they get it right.

VICE CHAIRMAN STETKAR: By definition, that test will be successful, --

MR. THOMAS: Yes.

VICE CHAIRMAN STETKAR: -- even if it takes them ten years to finally get it right.

MR. THOMAS: Right. And then they will have to follow it up with another one within 48 months.

VICE CHAIRMAN STETKAR: But that is a little bit different than the first bullet that says,

"I tested it randomly. It was successful. The next one, I tested it, and it was successful." Those re two samples that give you confidence. In the third one, it's one sample that gives you confidence.

MR. THOMAS: Right. And the third one, the reperform, the test that is reperformed, that's considered as an acceptable test for establishing performance.

MEMBER CORRADINI: I just have one -- John used the word "randomly." It's not really randomly, is it? I mean, they prepare for these tests fairly rigorously.

MR. THOMAS: Yes.

MEMBER CORRADINI: There is a whole lot of checking and tightening and --

MEMBER SHACK: But it's random in the failure history of the containment.

MEMBER CORRADINI: That's right. I just wanted to make sure --

VICE CHAIRMAN STETKAR: If they did all their preparations perfectly, they would never fail. But obviously they're never perfect.

MR. THOMAS: Appendix J option, we also require a general visual inspection of accessible interior as well as exterior containment surfaces for

structural deterioration that may affect leak-tight integrity. We conduct it prior to each Type A test and at periodic intervals between two Type A tests. So, to meet this requirement, the topical report specifies general visual examinations be conducted prior to each Type A test and during at least three other outages before the next Type A -- I mean, three outages between the Type A test if the test interval has been extended to 15 years.

To avoid omissions and applications, the topical report recommends that these visual examinations be performed in conjunction with or coordinated with the ASME, section XI, subsections IWE and IWL examinations that are required by 10 CFR 50.55a. And any deficiencies identified in these examinations are entered into the plant's corrective action program to determine cause and appropriate corrective action.

I will talk a little bit about containment in-service inspection program. Ten CFR 50.55a mandates licensees to develop and implement the containment in-service inspection program of class MC, which is steel containment, and class CC, concrete, containment pressure-retaining surfaces in accordance with ASME, section XI, subsections IWE and IWL. And

these are incorporated by reference in 50.55a with some regulatory conditions.

Now, subsection IWE requires general visual examinations of 100 percent of accessible class MC containment pressure retaining surfaces as well as metallic liners of concrete containments and subareas to be performed 3 times during a 10-year in-service inspection interval. So these would respond to approximately at least 4 examinations over a 15-year ILRT interval.

Subsection IWL requires general visual examination of accessible pressure-retaining surfaces of concrete containments to be performed every five years. Now, this would respond to approximately three examinations over a 15-year ILRT interval.

Now, any suspect areas found during these examinations are subject to detailed and augmented examinations and evaluation and repaired, if necessary.

Now, as noted previously, these IWE and IWL examinations are particularly used to meet the option B visual examination performed.

Now, to the limitations and conditions on the use of topical reporting, 94-01, 2-A or 3-A, the staff found that the guidance in the topical was

acceptable for referencing in the tech specs for extending ILRT intervals to 15 years provided six conditions were satisfied.

The first condition is back to the definition of performance leakage. In fact, the NCN standard has a little different definition than what's in NEI 94-01 with regard to the performance leakage. The NCN standard defines it test of some of the measure of Type A tests of the limit leakage rate. And the minimum leakage rate for all Type B and C pathways are isolated during the test.

The NEI 94-01 definition is a little more specific and inclusive and does address leaking that takes place, even during the performance of the test.

Essentially it defines the performance leakage rate as the sum of the Type A upper confidence limit leakage rate, which is measured, and the minimum pathway leakage rate for all Type B and C pathways that were in service, isolated or not limited but in the test position prior to performing the Type A test.

In addition, leakage pathways that were isolated during the performance of the test, the cause of excessive leakage must be factored into the performance determination. The second condition is that licensee provide a schedule of containment

inspection to be performed by in-between Type A tests. And this is typically an approximate typical schedule for a 15-year interval. And it might change.

And this condition is that licensees address the areas of containment restructure, potentially subjected to degradation.

This is to ensure the licensees identify any accessible and inaccessible areas that are more susceptible to degradation and any related operating experience. It is also meant to encourage licensees to explore and consider potential new NDE technologies that may be commercially available for inspecting inaccessible areas in the future to address potential degradations in inaccessible areas but fully recognize that these techniques are not fully commercially viable at this time. But the conditions meant, you know, to encourage licensees to explore those technologies.

The fourth condition is that the licensees address any tests and inspections performed following major modifications to the container structure, as applicable. Now, this condition is intended to ensure that licensees understand that, you know, any major containment modifications, such as creating containment opening for steam generator replacement,

should be followed either by a Type A test or an alternate test but to provide verification of both structural integrity as well as leak-type integrity of the restored structure.

VICE CHAIRMAN STETKAR: If a licensee adopts this approach, looking at that third sub-bullet there, does the staff audit their program to gain confidence that they are indeed folding in industry operating experience.

I mean, the other three bullets there are things that I can commit to, you know, in a broad programmatic sense, the third one about addressing areas of the containment structure potentially subject to degradation.

You mentioned operating experience and the use of that experience.

MR. THOMAS: Right.

VICE CHAIRMAN STETKAR: Is that audited? I mean, how does that staff gain --

MR. THOMAS: Well, normally they provide information that, you know, they're participating in user groups and professional society, you know, committees that they're working on NDE technologies, you know, and that they will explore and consider such technologies in the future. It's a little --

VICE CHAIRMAN STETKAR: But I can tell you that I am going to do that.

MR. THOMAS: Right.

VICE CHAIRMAN STETKAR: But do you actually go out and confirm that I am doing it in some sort of active -- for example, we have had examples where people have found degradation and containment liners, degradation and moisture barriers and things like that.

MR. THOMAS: Right.

VICE CHAIRMAN STETKAR: Does the staff go out and audit a particular licensee and say, "Well, how are you addressing this for your containment? Because you have committed to do that as part of this program.

MR. THOMAS: Right. Well, specifically with regard to this, we haven't done any audits so far. Understand, you know, when they make the submittal, they, you know, acknowledge that they would consider and explore such technologies in the future.

MEMBER SHACK: Now, most of them, of course, if they're going for license renewal, they'll probably go forward --

MEMBER STETKAR: I was going to mention that. We see it in license -- we see a snapshot at

license renewal, but not --

MEMBER SHACK: Well even there, I mean it's more than a snapshot. There's generally a more serious commitment to an aging management program than involved with containment.

MEMBER STETKAR: That's true, that's true.

MR. THOMAS: In operating reactor space, special events, you know. So specific issue is identified. Then the regions and the staff, they do follow up, but you know, how it's addressed, and --

CHAIRMAN ARMIJO: If a licensee has a containment that already has pretty significant degradation, and we can think of a few, is there some sort of criterion that says this does not apply to you because you've eaten up a lot of your margin due to corrosion or something else, or is everybody treated the same?

MR. THOMAS: Well, we do look at the highlights of, you know, findings from the inspection programs when reviewing these applications.

MEMBER SHACK: But I think the answer, Sam, is that everybody has to meet the code specs, I mean you know. You meet the code.

MEMBER STETKAR: They do an analysis to show that you still meet the code specs --

CHAIRMAN ARMIJO: And once you're there, you're still okay.

MEMBER STETKAR: And once you're there, you're there. That's right, that's right.

MEMBER SCHULTZ: George, could you just expand a little on that last bullet. You said well after a major modification, the options are to either do a Type A test or another acceptable approach, and I didn't understand the "other acceptable approach." What would be found acceptable?

MR. THOMAS: Now this test, it's not part of the Appendix J program. You know, they do this test because the containment boundary has been breached, because of the modification that was done. So the requirement is that the pressure test that's performed should provide a verification of both the structural integrity as well as leak-tight integrity.

So one option is to do a Type A test, provide a measure of both structural as well as leak tight integrity.

MEMBER SCHULTZ: That I understand. What's the alternative?

MR. THOMAS: The other option was many licensees, they request relief of the proposed alternate to a Type A, and that would be, you know,

you could do a short duration structural test where the containment is pressurized to the land-basis accident pressure, and held for a minimum of 15 minutes for steam containment and about an hour for a concrete containment, and then they would do a visual examination of the required areas.

In addition, they have the containment pressurized, they would also do a local leak rate test in the area, especially for steam conditions around the wells, such as like a bubble test. That would provide the assurance, I mean verification of leak tight integrity of the required area.

That saves them a lot of time and cost, because a Type A test would take much longer to perform.

MEMBER SCHULTZ: And are those alternative tests which are found acceptable, are those submitted for approval?

MR. THOMAS: Yes, particularly --

MEMBER SCHULTZ: As part of the modification.

MR. THOMAS: --relief requests from code requirements.

MEMBER SCHULTZ: Okay, I understand. Thank you.

MR. THOMAS: The fifth condition is that the normal Type A test in the well should be extensions for 15 years, and the licensee is to utilize the provision in Section 9.1 of NEI-94-01, related to extending the interval beyond 15 years for a few months.

Then licensee must demonstrate to the NRC staff that there is an unforeseen emergent condition or a compelling circumstance. The staff position with regard to this has been clarified and Regulatory Issue Summary 1008-27, and essentially this condition is extended to discourage, you know, frivolous requests for ILRT extensions beyond 15 years, you know. We've got requests ranging from three months to 15 months.

The staff position is that the 15-year interval is a consensus upper bound performance-based interval, and extensions beyond that should be rare and used only in the very compelling or unforeseen circumstances, and would require NRC approval.

MEMBER SKILLMAN: What would be an acceptable compelling or unforeseen emergency condition? I mean the licensee knows that this 15-year time clock is counting on. What would be --

MR. THOMAS: Well one small unforeseen with, you know, a justifiable circumstance is when the

licensee has, for example, a major containment modification scheduled for the outage, following the ILRT due date, such as, you know, steam generator replacement.

So in that situation, if they are to do the Type A test within the due date, they would be performing, you know, two Type A or pressure system, pressure tests in consecutive refueling outages. In those situations, we have allowed them to perform the Type A test following the modification.

MEMBER SKILLMAN: Thank you.

MR. THOMAS: The sixth condition is the general condition for new reactors that are licensed under 10 C.F.R. Part 52, and requires that applications requesting permanent extension of ILRT interval of 15 years should be deferred until after the construction and testing of the containments for that design have been completed, applicants have confirmed the applicability of NEI 94-01, and the pre-report for risk assessment, including the use of past containment ILRT data.

Now with regard to the operating experience, between 1995 and Revision 0 of NEI 94-01 was issued, and you know, which allowed the Type A intervals to be extended to ten years, and Revision 2A

of the topical in 2008, approximately licensees of 94 operating reactors have requested and received approval for a one-time extension of the ILRT interval from 10 years to 15 years, based on performance.

Since then, three plants have received approval for extension of the ILRT to 15 years, based on directly adopting NEI 94-01 Rev 2A as the implementing document in the tech spec. Now out of these 94 reactors that were given a one-time approval --

MEMBER CORRADINI: If I might just ask, these are the three that went to 15 years were on a case-by-case basis. They presented some particular case which you evaluated?

MR. THOMAS: No, no. They were, they came in with a license amendment to adopt NEI 94-01 but 2A as they recommend in the document.

MEMBER CORRADINI: Okay.

MR. THOMAS: The other 94 were on a case-by-case basis.

CHAIRMAN ARMIJO: But only for one year, for one time?

MR. THOMAS: One time.

CHAIRMAN ARMIJO: Whereas the other three were kind of, are permanent?

MR. THOMAS: Yes, as long as they maintain the containment performance.

CHAIRMAN ARMIJO: Right.

MR. THOMAS: Acceptable containment.

MEMBER SHACK: Now back in September, we had 69 plants that completed the 15.

MR. THOMAS: Yeah.

MEMBER SHACK: So there's just more plants doing the tests or --

MR. THOMAS: Since then, about six have completed. So of the 94, 75 plants have completed the one-time Type A test with the extended 15-year interval, and there has been no reported failures. So the data indicates that the extension has not had any effect on performance.

CHAIRMAN ARMIJO: I just want to make sure I understand what a Type A test failure represents. Does that mean that the final test they passed? Could they have done initial tests, failed, done a fix and just --

MR. THOMAS: No.

CHAIRMAN ARMIJO: So it had to be leak tight the first time they did it?

MR. THOMAS: Yes.

MEMBER SHACK: They did a good preparation

is what I guess I'd say. This is not like a "I learn" test. It isn't.

CHAIRMAN ARMIJO: All right, okay. Thank you.

MR. THOMAS: Now I'm going to turn it over to rain Lee.

MEMBER BROWN: Can I ask a question?

MR. THOMAS: Yes.

MEMBER BROWN: In part of the paper, there was a discussion of failure data evaluated for plants prior to 1995, on the ten-year test basis, prior to 1995 or '94, and that there was a certain failure rate, whatever that is for that set of data.

And then there was a statement that for evaluations of plant data that we did it on a 15-year extended period, there were fewer failures. Now I don't know whether I read that right, but it gave me the impression that if I tested the stuff every ten years, I had more failures, but if I tested every 15 years, I had a fewer failures, which didn't compute with me.

I don't know if I read it right or what. So either -- it's just a funny, funny data set to me.

MR. THOMAS: It's that, you know, more than 95 percent the leak gauge, excessive leak gauge

is typically through penetrations, and over the years licensees are doing a better job with regard to the local leak rate tests and maintaining performance of penetrations.

MEMBER BROWN: So you attribute the better performance just to better control of the leakage, to lower values from doing local leak rate tests and correcting actions, corrective actions?

MR. THOMAS: Right.

MEMBER SHACK: They've learned how to take the test.

MEMBER BROWN: That's right. I was just wondering. I didn't see a whole lot of other discussions. Thank you.

MEMBER STETKAR: Back in the 70's, when I was, you know, we were doing it, we had some learning to do.

MEMBER BROWN: Okay. Now that's --

MEMBER STETKAR: An unnamed reactor.

MEMBER BROWN: Thank you.

MR. LEE: I'll be short. I'll be discussing the limits of both Type B and Type C tests, as it relates to Version 3 of NEI 94-01. The test intervals, they can be increased from 30 months up to a maximum of 120 months for a Type B test, and that is

no change from the previous guidance.

However, for a Type C test, they can be increased from 30 months up to 75 months, and that is a change. The previous guidance only allowed a maximum of 60 months before, and these extensions are allowed based on the successful completion of two periodic as-found tests, where the licensees, where the tests are within the licensee's administrative leakage limit.

And these leakage limits are established by each licensee, and they're documented and maintained for each component and prior to the performance of any local leak rate test.

CHAIRMAN ARMIJO: The containment air locks remain at 30 months?

MR. LEE: Yes.

CHAIRMAN ARMIJO: Okay.

MR. LEE: A testing failure is defined as any component that exceeds its administrative leakage limit, and if a failure happens, then that component has to go back, is required to go back on its base 30 month testing frequencies.

In support of Revision 3 to NEI 94-01, NEI did a case study where they collected data post-1995 for the leak tight performance of Type C containment

valves on extended intervals, and they presented this data on an EPRI report, 1022599.

The staff did an independent review of this report and determined that the failure rates of Type C containment on extended intervals were about an order of magnitude less than those valves that were tested prior to 1995, for the same Type C containment isolation valves on extended intervals.

Next slide. The regulatory limit for the combined leakage for all penetrations in valves, subject to Type B and Type C are, shall be less than .6 L sub A, and in the Revision 3 of NEI 94-01, Section 12.1 was revised to require that the post-audit report shall include the margin between the Type B and Type C leakage rate summation, and its regulatory limit of .06 L sub A.

Any adverse trends shall occur for this summation, it shall be identified and a corrective action plan developed, to restore the margin back to an acceptable level. In the staff's SER for --

MEMBER STETKAR: Brian?

MR. LEE: Yes.

MEMBER STETKAR: When you say "an adverse trend," if I'm doing this once every six years or so, and I operate the plant for 60 years, I get a chance

to do this like nine times in the life of the plant, right? What defines an adverse trend? The next one is slightly worse than the --

MR. LEE: An increasing margin.

MEMBER STETKAR: Honestly, a trend typically is something I can plot and draw a line through.

MR. LEE: Right.

MEMBER STETKAR: Does that just mean the next one is worse than the previous one?

MR. LEE: And when I say "the margin," it's the margin of the summation of the total.

MEMBER STETKAR: I understand that.

MR. LEE: Now the total is taken every, is recalculated every outage, because you're not testing every component every outage.

MEMBER STETKAR: Oh, okay. I see, yeah.

MR. LEE: I guess if you're on 60 months or if you're going to 75 months, you're testing each component every three outages. But you're rotating those components.

MEMBER STETKAR: Yes, yeah, yeah. Okay, I got it. So yeah. So you get that rolling type process.

MR. LEE: Right.

MEMBER STETKAR: Okay, thanks.

MEMBER SCHULTZ: In their as-found test, but that doesn't mean you can't do work on the penetrations after you do the test.

MEMBER STETKAR: Well, yes.

MR. LEE: All right. In the staff's SER for Revision 3 of NEI 94-01, we identified two limitations and conditions. The first one deals with extensions of up to nine months being permissible with the Type C valves, but only for non-routine and emergent conditions.

This provision does not apply to any valves that are restricted to its 30 month base testing interval, or any valves that are known to have any significant poor leakage history. The second condition discussed when routinely scheduling a local leak rate test beyond 60 months and up to 75 months, that the leakage testing program, trending or monitoring must include an estimate of the amount of understatement to the Type B and Type C totals, and this estimate should be included in the licensee's outage report, and also must include a reason and a determination of acceptability of the extension.

MEMBER SKILLMAN: On that Slide 15 please.

MR. LEE: Yes.

MEMBER SKILLMAN: In that first bullet, the last phrase "and those valves with a history of leakage." Are those valves in this context the valves at that facility, or that class of valve in industry?

MR. LEE: At that facility.

MEMBER SKILLMAN: Only at that facility?

MR. LEE: Yes.

MEMBER SKILLMAN: Okay, thank you. Thanks.

MR. LEE: So to summarize the revision of NEI 94-01, the major difference between Rev 0 and Rev 2 Alpha is that Rev 2 Alpha provides guidance or provisions for extending the Type A integrated leak rate test interval up to 15 years.

The major difference Rev 2 Alpha and Rev 3 Alpha is that 3 Alpha provides guidance for extending the Type C valves from 60 months to 75 months. The Appendix J testing program, which consists of the integrated leak rate tests and the local leak rate test, in conjunction with the containment ISI program, they together ensure that containment structural and leakage integrity is maintained through their service life.

And with that, I will turn it over to Antonio to discuss the risk aspects.

MR. ZOULIS: Thank you, Brian. Good afternoon. My name is Antonio Zoulis. I'm from the Office of Nuclear Reactor Regulation, the Division of Risk Assessment. My discussion today will focus on the risk aspects of the integrated leak rate testing, known as ILRT, and interval extension, which is found in Appendix J, Option B.

Specifically, the methodology we're going to discuss today is found in the EPRI report, entitled "Impact Assessment of Extended IRT Intervals," and also the safety valve evaluation, which we found the method acceptable to meet our regulatory requirements.

So the EPRI report was performed, and we issued a safety evaluation that reviewed the methodology, and we're going to talk about that later on, and we found that the method was acceptable to meet our regulatory requirements.

NUREG-1493, as George mentioned before, or Bruce mentioned before, was the technical basis for these approaches. It used risk-informed criteria to support modifying the regulation, to reduce what was deemed unnecessary regulatory requirements found at Appendix J.

The EPRI report built on that methodology and supports a risk-informed process which uses risk

insights, together with other factors, to better focus licensee and regulatory attention on design and operational issues commensurate with their importance to health and safety.

The reason we're not risk-based, of course, is because of the outdoor epistemic concerns used in our methods and processes and programs which we regulate. So it's a risk-informed process that utilizes risk insights, in conjunction with engineering methodologies and methods processes. I'll go on to the next slide.

So basically, the key principles for the risk-informed process supports our integrated decision-making, and is illustrated here and is found in Reg Guide 1.174 and other risk-informed guides. Basically, for it to be acceptable, it must be current regulation. The change has to be consistent with the defense indepth philosophy.

It can be altered. You don't have to be exactly the same, but it has to be consistent with the defense indepth methodology. Safety margins must be evaluated to assure that they are still acceptable.

The risk increase must be assessed and found to be small and consistent with our safety goals, and lastly and most importantly is the testing

rotations, the performance monitoring strategy must be in place, to ensure the changes do not adversely impact the safety function of the system, structure or components in question.

So you perform this, the analysis; the risk is small; and you need to make sure you monitor the performance of these changes, so that again, it's performance-based. You don't see any adverse trends or adverse performance due to the changes that were implemented, and as indicated before, we haven't seen that with this program.

Next slide, please. So the EPRI report demonstrates that the conclusions developed in NUREG-1493 are still valid. NUREG-1493 stated that reducing the frequency of Type A test LRTs from the current three to ten years to one per twenty years, was found to lead to imperceptible increase in risk. And as I said before, 1493 utilizes the risk-informed decision-making process.

The last time we were here, there was a question of why we chose 15 years as opposed to increase more to 20 years, and one of the reasons was due to, if you're going to do license renewal, we wanted to at least have one interval test between the next 20 years of the year extension.

So we don't want to have a plant that was out there for 20 years without at least having one successful test within its operating license.

The next slide, please. So the EPRI report basically concluded that well, we know that CDF is not significantly impacted by the extension of the ILRT interval. However, if your CDF or your mitigation relies on containment accident pressure for ECCS, then those licensees had to evaluate that impact to their core damage frequency, if there was one.

The method that we're evaluating is LERF. In addition to LERF, we look at the increase in the population dose, and the increase in the condition containment failure probabilities.

The ILRT failure is not just a failure of the test to measure the containment of leakage; it's the failures used to describe those tests in which the containment leak was identified above the acceptable criteria, that would not be detected by local leak rate test, containment inspection or other alternate means.

So the failure, we're focused on failures that you wouldn't be able to identify using your inspections, your other local tests, leak tests and those other programs. It was a subset of those

failures.

Next slide. So the key considerations from the EPRI report was the data. There was over 217 tests conducted with no ILRT failures. There are other means of detecting failures, as we mentioned before, the Type B, Type C tests, visual inspections and other ways of identifying leakage.

The estimations of the containment leakage, the use of 100 L sub A was very conservative, and basically we've never observed in any of the empirical data. The highest observed was 21 L sub A. There is a method, a process to adjust for liner corrosion, as mentioned before.

So you have a generic method for determining the change and likelihood of detecting liner corrosion, and the corresponding change in risk due to that, due to the extension of the ILRT. So those were all considered when you're doing the evaluation.

MEMBER SKILLMAN: George? Excuse me. Antonio, would you please go back to Slide 20?

MR. ZOULIS: Sure.

MEMBER SKILLMAN: As you introduced this slide, I believe I heard you say that this risk assessment must be conducted by those plants that take

credit for pressure, for ECCS performance. At least I think that's what you said.

MR. ZOULIS: What I was trying to say there was if you take credit for containment over pressure in your analysis, that would directly impact your CDF if you had a leak large enough to reduce that pressure.

So you need to make sure that when you're assessing the change to your risk, you take that into account, that you may not be able to credit overpressurization if you have a leak large enough.

MEMBER SKILLMAN: So does that mean if you do not take credit for CAT, you do not have to do this?

MR. ZOULIS: No, you have to also.

MEMBER SKILLMAN: You have to do it any case?

MR. ZOULIS: That's right.

MEMBER SKILLMAN: Thank you.

MEMBER CORRADINI: I guess we're hearing two different things. What I thought your answer to Dick was that, is that if you have CAT credit, you must ascertain the impact if you leak too much and therefore you have a connected failure.

If you don't need CAT credit, then that's

just not one -- that's not one of the threads you need to pull for the analysis. But you still have to do the analysis?

MR. ZOULIS: That is correct, yes.

MEMBER CORRADINI: Okay.

MEMBER STETKAR: Normally this would --

MEMBER CORRADINI: So I have it right though? Do I have that right?

MR. ZOULIS: Yes, that's correct.

MEMBER STETKAR: Normally, unless you take credit for CAT, this would have absolutely no effect whatsoever on CDF?

MR. ZOULIS: That is correct.

MEMBER STETKAR: The only way this can have an effect on CDF --

MEMBER SHACK: But you still have to go through the LRF change.

MEMBER STETKAR: You still, you'll always have to do it for LRF.

MEMBER SHACK: For LRF, yeah, yeah.

MEMBER STETKAR: Right, right.

MEMBER SHACK: I mean what it amounts to is that for CDF, you're worried about leaks like 25 times L sub A. For LRF, you're worried about leaks something like 100 times L sub A. So it changes the

threshold of --

MEMBER SKILLMAN: Concern.

MEMBER SHACK: Concern.

MEMBER SKILLMAN: Thank you, Antonio.

MR. ZOULIS: So basically, Slide 22. So there's six steps basically. I think Mr. Skillman, you were asking what's the process? Well, you basically identify your baseline risk in terms of the, using the EPRI action plans identified in the report for a three-year ILRT frequency, and you do that for your population dose and then you determine the change by going, you've tested to three to ten.

Most licensees do the ten-year interval and also do the 15-year interval. So they basically evaluate, have the three-year test interval, what's the risk going into a ten-year interval, what's the risk going into a 15-year interval, and you would do the delta risk.

You would also determine the containment, the conditional containment failure probability and the change in the population dose rate based on those integral changes. Many of the licensees consider internal and external events, and the sensitivity of the results due to the assumptions of liner corrosion.

So they, you go through that. They would

submit their license, their safety evaluation license amendment for review, and we would review all those, to make sure that they met their, their reporting of results were the change was small. The change was small.

MEMBER STETKAR: Antonio, when people do these projections, they use kind of a standard linear incipient failure rate model; is that correct?

MR. ZOULIS: I think we talked about that last time.

MEMBER STETKAR: Is that, and I don't remember the discussion. I think that's what they used, but I just wanted to make sure that that's -- thanks.

MEMBER SHACK: Except for the baseline corrosion, which isn't --

MEMBER STETKAR: Except for -- yeah, I was going to say. The corrosion is different, but as far as everything else?

MEMBER SHACK: Everything else.

MR. ZOULIS: So basically for the -- so in order to come in and get the change accepted, you need to make sure, you need to have a license amendment request. If, again, you take credit for CAT, you'd have to come in for a license amendment. You couldn't

just take credit or you couldn't just do it without coming for a license amendment.

Your PRA has to be Reg Guide 1-200 compliant, and it has to -- the requirements for risk-informed submittals, and you have to meet the five key principles of the Reg Guide 1.174, in order to be able to have this change made to your license.

MEMBER BLEY: Antonio, how do we -- how do they show that they're Reg Guide 1-200 compliant?

MR. ZOULIS: Most of them submit their, the EPRI, the peer review results, and if there are any Type A or B significant findings or observations, they would have to tell us how they addressed those before the submitted --

MEMBER BLEY: But they actually submit the findings?

MR. ZOULIS: If they don't, we usually request them. I've requested twice on my own, where we want to request what the FNOs were, how they addressed them.

MEMBER BLEY: But you've always got to look at those.

MR. ZOULIS: Yes.

MEMBER SHACK: I'm a little confused by the first bullet, but just to get into this program,

don't you need a license amendment request? I mean he's going to have to have a license amendment request in any case, right, to take this program on? So it's not just the guys with CAT credit; it's everybody's going to need a license amendment.

MR. ZOULIS: I think that's specifically called out.

MEMBER SHACK: Well, I think they certainly have to consider containment over pressure, but I mean everybody's going to have to come in for a license amendment to pick this program up.

MR. THOMAS: Yeah. The regulation requires the implementing document to be included by reference in the tech spec. So if there's a change in the implementing document, our taking exception to their current implementing document. They have to come with a license amendment.

MEMBER BLEY: It sounds like almost everybody's done that now, is that right? On those numbers you showed us --

MR. THOMAS: They have come for a one-time basis.

MEMBER BLEY: Okay.

MEMBER SHACK: They'll be --

(Simultaneous speaking.)

MEMBER BLEY: That was the big number, yes. Okay.

MEMBER STETKAR: Did the one-time applications need to meet requirements with respect to the PRA or they did?

MR. ZOULIS: The original core application, yes, which it is.

MP They have to do something. That's my understanding.

MR. THOMAS: Typically, these applications are reviewed by at least three branches: NRR, Division of Engineering, Mechanical and Civil Engineering Branch and NRR-BSS Containment and Ventilation Plans, as well as NRR Division Risk Assessment, licensing PRA plants.

MR. LIN: Just to summarize, in conclusion, I think Appendix J containment leakage program and the containment ISI program together ensure that the containment structures and leakage integrity is maintained through service life.

NRC staff finds the guidance in NEI Topical Report 94-01 acceptable, subject to the limitations specified in the safety evaluations, and the staff finds the EPRI methodologies for evaluating the risk associated with the interval extension

acceptable, and consistent with the five key principles of Reg Guide 1.174.

This provision of the Reg Guide reflects the latest staff position based on Revision 2A of the NEI topical report. There are no new staff positions that have been promulgated in this revision. I think that concludes our presentation, and I guess we'll open it for questions.

MEMBER BROWN: Your SE had a limiting or a kind of a limitations in condition at the end, talking about testing of Type C valves, and there was -- this was a concern if you -- that if you started testing some based on their performance at a higher, at an extended period than you did the summation, you would have earlier valves and you would bias with more good data the old ones, and then not --

I may be -- I could read it. I'm trying to paraphrase it. You would bias the data higher and higher and lose track of the performance of earlier valves. You put a condition at the end, and you made a comment that said hey, it leads to the possibility that the LLRT totals calculated will understate the actual leakage potential of the penetrations when you're doing your comparison to your -- you have the number. You want to compare it to the .6 L sub A or

something like that.

So that you go through and you did another statement talking about given the required margin that most plants see, that using a five-year test frequency is supposed to be conservatively accounted for. It's thought that it is conservatively considered or it's accounted for conservatively.

It's thought. It didn't say you had any analytical basis for that. It just said it's thought. But then you extended that to the 75 month interval, by saying it should also be conservative, without any other statement. But that's kind of a condition that they have to determine that the trending is not understated. Is this part, is that in any 94 Rev 3?

MR. LEE: It kind of goes with Section 12.1, I think is the previous slide.

MEMBER BROWN: How does a guy know this later? Is this thing tucked into the NEI?

MR. LEE: Yes.

MR. LIN: The safety evaluation? Yes. It's in the NEI.

MEMBER BROWN: Oh, okay. So this comes prior to it. Okay.

MR. LIN: NEI Rev 3.

MEMBER BROWN: 3A.

MR. LIN: 3A is included as NRC safety evaluation.

MEMBER BROWN: Okay, all right. I got it. I got it. Didn't know that.

MEMBER SHACK: That's why it gets so confusion as you read through here. Sometimes it's 3A, sometimes it's 3, and the one has the stuff already in it; the other one doesn't.

MEMBER BROWN: Well, I noticed 2A had a 2 and also there was a 2A. I started, I lost track of that after a while.

MR. LIN: A is the acceptable version.

MEMBER BROWN: Okay. So this is -- that's why, that's how everybody will know, because it just doesn't get put into a safe somewhere and say well yeah, we got it approved. All right. Thank you.

MR. LEE: It's part of the NEI document.

MEMBER SCHULTZ: So was the 3A document actually modified to incorporate the request of the approval of the SER?

MR. LEE: Yes, yes. Rev 3A is what we review, and after we came out with our SER, Rev 3 Alpha included our SER with these limitations and conditions.

MEMBER SCHULTZ: It included the SER. But

did it also modify the language in the NEI document? That would have been my impression, not just that the SER was attached to the document with the conditions.

MR. LEE: Not to my knowledge that it modified the document. I mean it says that the licensee would have to meet these limitations or conditions, you know, when they adopt this.

MEMBER SCHULTZ: The document said that?

MR. LEE: Yes.

MEMBER SCHULTZ: Okay. That's what I would have expected. Thank you. I'm done.

MEMBER SHACK: Any additional questions? Any questions from the audience?

(No response.)

MEMBER SHACK: Well, thank you very much. Containment integrity's been a strong thing of interest to the NRC, I mean for the ACRS for a long time, and so we really didn't want to look at this again, just to kind of refresh it. Haven't looked at it in a long time, and I appreciate your discussions and presentations. Oh, there's no chairman. It's back to you.

(Laughter.)

MEMBER SHACK: You're not chopped liver, right?

MEMBER BLEY: Mr. Vice Chairman, before you let us all go, Sam and Antonio set up -- oh, you know about this?

MEMBER STETKAR: I know about this. I was going to --

MEMBER BLEY: Then I'll be quiet.

MEMBER STETKAR: I was going to adjourn because we're adjourning, and then keep us here for a couple of minutes. So I'd like to thank the staff, and we are adjourned.

(Whereupon, at 2:04 p.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 Full Committee Meeting
March 7, 2013

Bruce Lin
RES/DE/CIB

Brian Lee
NRR/DSS/SCVB

George Thomas
NRR/DE/EMCB

Antonios Zoulis
NRR/DRA/APOB

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

Regulatory Guide 1.163

Outline

- Background
- Performance Based Type A Tests
- Performance Based Types B & C Tests
- 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 allowed licensees to voluntarily replace existing Option A testing requirements with requirements based on leakage rate performance, and a supporting plant-specific risk impact assessment
  - NUREG-1493 (1995) “Performance-Based Containment Leak-Test Program” provided the technical bases for NRC’s 1995 rulemaking that added an Option B to Appendix J

Regulatory Guide 1.163

Background

- NEI TR 94-01 “Industry Guideline for Implementing Performance-Based Option of 10 CFR Part 50, Appendix J”
  - 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
  - Specific details of the testing methodology and requirements are contained in ANSI/ANS 56.8-2002
  - Revision 0 was issued in 1995
  - Revision 2-A was issued in October 2008 which included provision for extending the performance based ILRT interval to 15 years
  - Revision 3-A was issued in July 2012 which included guidance for extending Type C local leak rate test (LLRT) interval from 60 months to 75 months

Proposed Revision 1 to RG 1.163

- RG 1.163 “Performance-Based Containment Leak-Test Program”
  - Revision 0 was issued in1995 which endorsed NEI 94-01, Revision 0, with limitations and conditions
  - DG 1220 (Proposed Revision 1 to RG 1.163) endorses NEI TR 94-01, Rev 3-A subject to limitations and conditions provided in the NRC Safety Evaluations for Rev 2 and Rev 3
- This revision of RG 1.163 reflects the latest staff positions based on Revision 3-A of the NEI TR 94-01 guideline

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 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
  - 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

- 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

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

Operating Experience

- Extension Requests
  - Approximately 94 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
  - Approximately 75 plants have completed the one-time approved 15-year Type A test to date. There has been no reported Type A test failures

Performance-Based Types 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

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EPRI Report (Cont.)

- CDF is not significantly impacted by an extension of the ILRT interval
- In addition to LERF, EPRI risk assessment takes into consideration 2 additional metrics
  - Increase in population dose
  - Increase in conditional containment failure probability

$$\Delta \text{ LERF} = \Delta \text{ ILRT Failure Probability X CDF}$$

$$\Delta \text{ Population Dose} = \Delta \text{ ILRT Failure Probability X Population Dose}$$

$$\text{CCFP} = 1 - (\text{Intact CDF} / \text{Total CDF})$$

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

Regulatory Guide 1.163

EPRI Report (Cont.)

- Final SE for NEI TR 94-01, Rev 2 & EPRI Report No. 1009325, Rev 2
  - 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

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 NEI TR 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