

Official Transcript of Proceedings

**NUCLEAR
COMMISSION**

REGULATORY

Title: Advisory Committee on Reactor
Safeguards US EPR DCD Subcommittee
Meeting

Docket Number: (n/a)

Location: Rockville, Maryland

Date: Tuesday, April 6, 2010

Work Order No.: NRC-162

Pages 1-142

1323 Rhode Island Avenue, N.W.
Washington, D.C. 20005
(202) 234-4433

1
2 DISCLAIMER
3

4
5 UNITED STATES NUCLEAR REGULATORY COMMISSION'S
6 ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
7

8
9 The contents of this transcript of the
10 proceeding of the United States Nuclear Regulatory
11 Commission Advisory Committee on Reactor Safeguards,
12 as reported herein, is a record of the discussions
13 recorded at the meeting.
14

15 This transcript has not been reviewed,
16 corrected, and edited, and it may contain
17 inaccuracies.
18
19
20
21
22
23

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

+ + + + +

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

+ + + + +

SUBCOMMITTEE ON THE US EPR DCD

+ + + + +

TUESDAY,

APRIL 6, 2010

+ + + + +

ROCKVILLE, MARYLAND

+ + + + +

The Subcommittee met at the Nuclear
Regulatory Commission, Two White Flint North, Room
T2B3, 11545 Rockville Pike, at 8:30 a.m., Dr. Dana
Powers, Chairman, presiding.

COMMITTEE MEMBERS:

DANA A. POWERS, Chairman

SANJOY BANERJEE

HAROLD B. RAY

MICHAEL T. RYAN

WILLIAM J. SHACK

JOHN W. STETKAR

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25

NRC STAFF PRESENT:

DEREK WIDMAYER, Designated Federal Official

GETACHEW TESFAYE

JASON JENNINGS

MICHELLE HART

JEAN-CLAUDE DEHMEL

JOSH WILSON

PETER HEARN

HIEN LE

JOSEPH DeMARSHALL

PETER KANG

ALSO PRESENT:

PEDRO SALAS

PEDRO PEREZ

CRAIG SCHMIESING

ROBERT SHARPE

PAUL BERGERON

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25

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

AGENDA ITEM	PAGE
Introduction	4
NRC Staff Introduction
	7
U.S. EPR DC Application FSAR	
Chapter 11, Radioactive Waste	8
U.S EPR DC SER with Open Items for	
Chapter 11, Radioactive Waste	
Management	64
U.S. EPR DC Applications FSAR	
Chapter 16, Technical Specifications	86
Adjourn	

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS
1323 RHODE ISLAND AVE., N.W.
WASHINGTON, D.C. 20005-3701

1
2
3
4 P-R-O-C-E-E-D-I-N-G-S

5 (8:28 a.m.)

6 INTRODUCTION

7 CHAIR POWERS: The meeting will come to
8 order. This is a meeting of the advisory committee
9 on reactor safeguards, U.S. EPR Subcommittee. I'm
10 Dana Powers, the Chairman of the Subcommittee. ACRS
11 members in attendance are Bill Shack, John Stetkar,
12 Harold Ray, Michael Ryan, Sanjoy Banerjee. Derek
13 Widmayer is the ACRS staff who is the designated
14 federal official for this meeting. I have no idea
15 what their allegiances are for the various members of
16 the Final Four, but I'm sure --

17 MEMBER SHACK: Go Bulldogs.

18 CHAIR POWERS: The purpose of this
19 meeting is to continue our review of the SER of open
20 items from the design certification documents
21 submitted by AREVA NP from the US EPR design. We will
22 hear presentations and discuss Chapter 11 Radioactive
23 Waste Management and Chapter 16, Technical
24 Specifications.

25 The Subcommittee will hear presentations

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 by and have discussions with representatives of AREVA
2 NP, the NRC staff, and other interested persons
3 regarding these matters. The Subcommittee will gather
4 relevant information today, and plans to take the
5 results of the reviews of these chapters along with
6 other chapters reviewed by the Subcommittee to the
7 full committee when it meets May 6th, in 2010. Which
8 seems like a little bit of a change in schedule,
9 doesn't it. A little bit. We can endure.

10 MR. WIDMAYER: A little bit.

11 CHAIR POWERS: The rules for
12 participation in today's meeting have been announced
13 as part of the notice of this meeting previously
14 published in the Federal Register. We have received
15 no written comments or requests for time to make oral
16 statements from members of the public regarding
17 today's meeting. But, if people do have something to
18 say today I would encourage them to get my attention
19 and we will try to get you time at a microphone and
20 hear what you have to say.

21 A transcript of the meeting is being kept
22 and will be made available as stated in the Federal
23 Register Notice. Therefore we request that
24 participants in this meeting use microphones located
25 throughout the meeting room in addressing the

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 Subcommittee. The participants should first identify
2 themselves and speak with sufficient quality and
3 volume so that they may be readily heard. And we kind
4 of introduced another little tradition in this
5 Subcommittee, it is the first time you speak to the
6 committee, please give us a little of your background
7 so we know who you are, what you do, where you were
8 educated, whether you support Duke or that other team
9 whatever it was that played in the Final Four, things
10 like that. The essential pieces of information.

11 A telephone bridge has been established
12 with the meeting room today, and I understand we have
13 participants from AREVA NP on the line. We request
14 that the participants on the bridge line identify
15 themselves when they speak, and keep their telephone
16 on mute during the times when you are just listening.

17 Do any of the members of the Subcommittee
18 have opening comments that you would care to make?

19 (No response.)

20 MR. WIDMAYER: I think Theron still needs
21 to put the telephone line up.

22 CHAIR POWERS: Okay, so we are going to
23 get to listen to that.

24 MR. WIDMAYER: Listen to the dialing.

25 CHAIR POWERS: Okay, during the dialing

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 period we will suffer.

2 We will now proceed with the meeting. And
3 as has been our tradition and fashion, we will start
4 with you, Ray. First of all, essential, are you a
5 Butler or a Duke guy?

6 MR. TESHAYE: Neither.

7 CHAIR POWERS: Neither? So you're really
8 depressed?

9 Go ahead.

10 NRC STAFF INTRODUCTION

11 MR. TESHAYE: Good morning, Mr. Chairman.

12 My name again is Getachew Tesfaye. I'm
13 the NRC project manager for AREVA EPR design
14 certification project.

15 This morning we continue our Phase 3 SERS
16 presentation of the staff Safety Evaluation Report
17 with Open Items.

18 Today we have completed the Phase 3
19 presentation of seven chapters. We presented Chapter
20 8, Electric Power, and Chapter 2, Site
21 Characteristics, on November 3rd, and Chapter 10,
22 Steam Power Conversion System, and Chapter 12,
23 Radiation Protection, on November 19th, 2009.

24 On February 18 and 19 of this year we
25 presented Chapter 127, Quality Assurance, and portions

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 of Chapter - Chapter 17, Quality Assurance, and
2 portions of Chapter 19, Probabilistic Risk Assessment
3 and Severe Accident Evaluation.

4 On March 7th of this year we presented
5 Chapter 4, Reactor; Chapter 5, Reactor Cooling System
6 and Connected Systems.

7 Today we will present Chapter 112,
8 Radioactive Waste Management, and Chapter 16,
9 Technical Specifications. We will be briefing the
10 ACRS full committee on Thursday, April 8, on the seven
11 chapters that are completed so far. And we are also
12 scheduled to complete Chapter 19 presentation on April
13 21, 2010.

14 That completes my remarks, Mr. Chairman.
15 If there are no other questions.

16 CHAIR POWERS: Okay, we got a lot of open
17 items to go through?

18 MR. TESFAYE: Not quite.

19 CHAIR POWERS: Okay. Okay, well, Mr.
20 Salas.

21 U.S. EPR DC APPLICATION FSAR CHAPTER 11,

22 RADIOACTIVE WASTE MANAGEMENT

23 MR. SALAS: Thank you very much.

24 I'm a Florida graduate, so we were
25 eliminated earlier this year.

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 CHAIR POWERS: I think there was a great
2 line from one of the candidates for senator from
3 Florida who said, there is a class of people in this
4 world that think only graduates of elite universities
5 should lead. That's not fair, because most people
6 can't go to the University of Florida.

7 MR. SALAS: In terms of myself, I started
8 my career - I've been with AREVA for four years but
9 before that I spent my career in the operating side,
10 actually new licensing. I started my career at
11 Carolina Power & Light during the licensing of Shearon
12 Harris. And I came in kind of on the tail end. And
13 going back to licensing new plants. From there I
14 spent with the licensing manager doing the restart of
15 Browns Ferry 2 and 3.

16 CHAIR POWERS: So you've been busy.

17 MR. SALAS: I've been busy. I went to
18 Sequoyah during the difficult times and helped bring
19 that unit back to good shape. And finally ended up
20 before coming to AREVA spent a couple of years over at
21 Dresden with Exelon. So I've been in the older units
22 as well as the new units it is nice to being able to
23 actually start eliminating some of the challenges that
24 we face in the operating side.

25 We are here today to present to you

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 Chapter 11, particularly those design pieces critical
2 to the ERP, to the design and operation. For our
3 presentation we have two Pedros today, two Cubans,
4 actually. And Pedro will be our presenter, but I
5 think before he does his Chapter 11 presentation, I
6 think that the last time that he was here you left him
7 with the homework assignment. And I think he is happy
8 to report on that.

9 CHAIR POWERS: He has been here before, he
10 did adequately right?

11 (Laughter.)

12 MR. PEREZ: That's why I had a homework
13 assignment. I have been here in front of you before.

14 My name again, Pedro Perez. And when I present
15 Chapter 12, Radiation Protection, Dr. Ryan asked me
16 the question: who is the occupational person who
17 receives the highest dose? And I could not answer
18 that at that point. I went back to the office, and
19 report now that reviewing our calculations the
20 individuals that perform the reactive vessel
21 inspections, the UT inspections, are - we calculate
22 and estimate the highest dose to be 800 millirem. So
23 for one shift for that person.

24 MEMBER RYAN: And that is a one time --

25 MR. PEREZ: Exactly, so that one

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 activity, that one individual, performing that one
2 task - supporting that task.

3 MEMBER RYAN: And that's done how often?
4 It's quite a long frequency..

5 MR. PEREZ: It's a long frequency. There
6 are other activities during the outage, but those are
7 much lower.

8 MEMBER RYAN: Yes, sure.

9 CHAIR POWERS: This is kind of an
10 expected result but it also adds fuel to our interest
11 that we historically had in NDE methods.

12 MEMBER SHACK: I guess I'm a little
13 surprised with the automation at today's NDE --

14 CHAIR POWERS: You still got to hook
15 stuff up Bill. There's just no two ways about it.
16 You still got to hook the stuff up. And when you have
17 to hook it up - I mean if people would design the
18 plants better we wouldn't have this problem.

19 MEMBER RYAN: What is the time that you
20 have estimated for that UT exam?

21 MR. PEREZ: Okay, that entire operation
22 is if I recall it is about 40 hours. And I looked at
23 how you would divide people in shifts, so I optimized
24 it in 8-hour shifts, one person, and I looked at the
25 highest dose rate in a room and that's how I came with

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 the 100 millirem per hour times 8 hours, and that's
2 how I came up with that.

3 Clearly in practice you would look at, as
4 much as you can, local hot spots, or local - you know
5 low dose areas that you would set up.

6 MEMBER RYAN: I assume change of
7 personnel somewhere halfway through.

8 MR. PEREZ: Exactly.

9 MEMBER RYAN: So this isn't really a true
10 real dose. This is an ALARA, planning.

11 MR. PEREZ: Correct.

12 MEMBER RYAN: I just want to make it
13 clear to everybody, that we are not expecting one
14 individual necessarily to get 800 millirem.

15 CHAIR POWERS: But from a design
16 perspective that is the number we wanted and it is
17 exactly what we were looking for, thank you. That is
18 very useful to us.

19 MR. PEREZ: If there are no further
20 questions on this, then this morning, we will present
21 Chapter 11 of the US EPR FSAR dealing with radioactive
22 waste processing. We will follow the Standard Review
23 Plan, which starts 11.1 source terms, liquid waste
24 management systems, 11.2, gaseous waste management,
25 11.3, solid waste, 11.4, and the last chapter looks at

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 process and effluent radiological monitoring and
2 sampling systems.

3 Just a brief description of the buildings
4 that we will be discussing. Here is your radioactive
5 waste processing building, primarily for liquid waste
6 processing and liquid waste storage, and solid waste
7 processing and solid waste storage.

8 And then the gaseous waste processing is
9 in the nuclear auxiliary building. Just to give you a
10 brief overview of the plant layout.

11 The EPR radiation source terms are
12 summarized in 11.1 for both normal and accident
13 conditions. You may recall I was here in November
14 where we talked about Chapter 12, and there we talked
15 about the shielding source term. And then in the near
16 future with Chapter 15 we will talk about the design
17 basis accident source terms.

18 But everything starts with a core
19 inventory, and from there we develop the source term,
20 and we start there in Chapter 11, Section 1.

21 Just a brief background. The design basis
22 source term starts with a bounding core inventory
23 using ORIGEN 2. We perform a set of parametric case,
24 enrichment from 2 weight percent, 3.5, and 5 weight
25 percent, and we went through different burnup steps

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 from 5 gigawatts per metric ton to 62. And came up
2 with a bounding core inventory from which to derive
3 the liquid source terms and gaseous source terms.

4 Primary and secondary system radionuclide
5 concentrations are based on a 1 percent failed fuel
6 fraction following SRP 11.2. Again, nonmechanistic,
7 that's what the SRP said, that's what we apply.

8 However, the halogens and noble gases are
9 said to represent a dose equivalent iodine-131 and
10 xenon-133 that's governed by the technical
11 specifications.

12 Cooling secondary concentrations are also
13 based on the technical specifications, primary to
14 secondary technical specifications, leakage rate of
15 600 gallons per day. So to derive that secondary
16 source term, we applied that leakage rate from the
17 technical specifications.

18 Activation and corrosion product are taken
19 from ANSI 18.1 as well as tritium concentrations.

20 The source terms for the design basis they
21 are used to demonstrate compliance with the
22 concentrations in the 10 CFR 20 Appendix B, and also
23 demonstrate that we meet the design - those design
24 objectives, biodesign objectives of 10 CFR 50 Appendix
25 I.

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 So we did it with design basis
2 concentrations and with realistic source term. These
3 were derived directly from ANSI/ANS 18.1. For the
4 concentrations and the liquid gaseous effluents were
5 taken by the GALE code, GALE-L for forms of liquid
6 effluents, and GALE-G, for forms of gaseous effluents.

7 We also used these realistic
8 concentrations to demonstrate that you are clearly
9 going to have compliance with 10 CFR 20 Appendix B,
10 and compared to the design basis we show that the
11 depth we have and capability to handle up to a 1
12 percent design fail fuel.

13 So the expected concentrations are the
14 realistic ones. The design concentrations were used
15 simply to show you that there is sufficient capacity
16 of the system to handle up to that level fail fuel.

17 Here is a slide that just simply
18 summarizes what I described. Liquid and gaseous
19 source terms on the right, you have the realistic
20 following the ANSI standard for concentrations,
21 following GALE to get the effluent, both gaseous and
22 liquid. And from there we perform about 20
23 concentration comparisons, some of the ratios, the
24 cost-benefit analysis, and dose assessments.

25 On the left side we have the design basis.

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 And .25 failed fuel was used for Chapter 12 shielding
2 which I presented back in November. And the initial
3 RCS concentrations for the Chapter 15 design basis
4 accident. Again the initial concentrations. We also
5 used the 1 percent failed fuel for that Part 20
6 Appendix B, and these two concentrations - these two
7 comparisons are simply as I stated to demonstrate that
8 we have sufficient capacity for a high failed fuel
9 failure.

10 We also used the 1 percent failed fuel
11 assumptions in performing the Regulatory 1.143
12 classification of the system, and it's classified RW-
13 IIa, that assessment.

14 A note about the cost-benefit analysis.
15 We performed the - all the evaluations following the
16 SRP and following the regulatory guidance. And we
17 deviated from there, I like to point that out, for the
18 cost-benefit analysis we started with Regulatory Guide
19 1.110, with some differences. This is a 60-year plant
20 life, so we went up to a 60-year evaluation.

21 We also looked at the updated NRC dollar
22 cost per person rem from \$1,000 to \$2,000, and we did
23 not adjust equipment cost for inflation. To basically
24 biased the analysis conservatively. So these are some
25 differences that you will see in the FSAR.

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 Now 11.2, we'll talk about liquid waste
2 management system. It collects, processes and
3 discharges waste liquids, and maintains a design to
4 maintain doses ALARA.

5 It consists of two systems: a liquid waste
6 storage system; and a liquid waste processing system.

7 The liquid waste storage system segregates the liquid
8 waste into five storage tanks, collects the treated
9 waste in two monitoring tanks, and chemically adjust
10 that liquid to acceptable chemical value like pH
11 before discharging it to the environment.

12 The liquid waste processing systems
13 consists of an evaporator, centrifuge and a
14 demineralizer.

15 The liquid waste storage system as I
16 mentioned segregates the waste into Group I liquids
17 which are high activity levels, with low levels of
18 organic and inorganic substances and low conductivity.

19 These are fuel pool systems, drains, sumps,
20 decontamination operations. And these are normally
21 processed by the evaporator.

22 Group II liquid waste consists of low
23 activity levels, high levels of organic substances,
24 and high conductivity, for example, from hot
25 laboratory, from showers, washrooms, Steam Generator

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 blowdown demineralizer flushing water. These are
2 normally processed by the centrifuge.

3 Group III liquid waste normally has no
4 activity, and may have high levels of organic
5 substances and conductivity. These come from non-
6 radioactive floor drains; steam generator blowdown
7 demineralizer flushing water if it's not radioactive.

8 If activity exists in this waste stream then the
9 waste will be processed by the centrifuge. If no
10 activity, waste is sent directly to the monitoring
11 tank after a short hold-up of storage in a storage
12 tank.

13 MEMBER STETKAR: Pedro?

14 MR. PEREZ: Yes.

15 MEMBER STETKAR: Before you go on to the
16 next slide.

17 MR. PEREZ: Yes.

18 MEMBER STETKAR: I think that I read
19 somewhere that the storage tank capacity, you
20 segregate the waste in your storage tanks, right?

21 MR. PEREZ: Yes.

22 MEMBER STETKAR: The capacity for the
23 Group I and Group II wastes was enough to store two
24 plus weeks worth of estimated waste, but that the
25 Group III waste storage tank capacity was about a

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 week's worth of waste generation, and that your waste
2 processing capacity was such that you could process
3 that amount of waste within about half a week. So
4 according to my notion you have about a half-week's
5 worth of waste generation margin, excess storage
6 capacity.

7 I've reopened a plant where the designers
8 told us that we had more than enough storage capacity,
9 and we wound up flooding the rooms that had the
10 storage tanks in it, we wound up bringing in all sorts
11 of excess, extra waste processing equipment because
12 the designers were wrong by about a factor of five.

13 This doesn't seem like a lot of margin.
14 So can you tell me a little bit about that? I'm not
15 so much concerned about the Group I and Group II. I'm
16 a little bit more concerned about the Group III, why
17 the presumption that you are going to actually be able
18 to process that stuff that quickly.

19 MR. PEREZ: One of the things I mentioned
20 and I didn't emphasize was that Group III is not
21 expected to have activity. So the residence time in
22 that storage tank will be very short, and you go
23 directly to the monitoring tank.

24 MEMBER STETKAR: Okay.

25 MR. PEREZ: And the monitoring tank there

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 are two tanks that you can count on to hold up until
2 you can then have --

3 MEMBER STETKAR: You still process it to
4 some extent though, don't you?

5 MR. PEREZ: Yes.

6 MEMBER STETKAR: Through an evaporator?

7 MR. PEREZ: Not the Group III. Where
8 you find activity, if you sample and you realize this
9 is either Group I or Group II, then you can route it
10 back okay to fully evaporate all the centrifuge. But
11 the design is that there shouldn't be any activity,
12 and - or very low activity. I mean obviously you have
13 tritium. And in that case you've just valved it over
14 to the monitoring tanks, and you are ready and have
15 the capacity in the monitoring tanks to discharge, you
16 discharge. So that is the concept. That is why there
17 is only one tank for the Group III. You are not
18 expected to hold it up very long.

19 MEMBER STETKAR: Okay. Thanks.

20 MR. PEREZ: As I mentioned discharge to
21 the environment is from the monitoring tanks, and
22 environmental releases is made once radioactivity and
23 chemistry such as pH or within the limits. The
24 release line is administratively locked and monitored,
25 and plant discharges are continuously monitored and

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 recorded in the activity-measuring tank. These are
2 small tanks with instrumentation that is continuously
3 process monitoring on the effluent. Has the
4 capability to automatically isolate the release should
5 activity exceed a predetermined limit. And as I
6 mentioned before the liquid waste storage system is
7 high hazard classification for Reg Guide 1.143, RW-
8 IIa.

9 MEMBER RYAN: What is the continuous
10 discharge set up to monitor?

11 MR. PEREZ: What is --

12 MEMBER RYAN: How is monitoring performed
13 and for what?

14 MR. PEREZ: Okay, it's a gross activity.

15 MEMBER RYAN: Just gross gamma.

16 MR. PEREZ: Yes.

17 MEMBER RYAN: Again that continuous
18 spectral measurement with the key radionuclides.

19 MR. PEREZ: You do that before you put
20 the liquid into the tank.

21 MEMBER RYAN: Into the discharge tank.

22 MR. PEREZ: Exactly, into the monitoring
23 tank.

24 MEMBER RYAN: You are batching it into
25 the discharge tank?

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 MR. PEREZ: Yes, and then that is again
2 another barrier, another defense, just in case you
3 have - you know you are monitoring for this gross
4 activity.

5 MEMBER RYAN: Right, so it's really a
6 batched discharge setup, where you take a sample, do
7 you discharge tank, and then verify that sample and
8 off it goes.

9 MR. PEREZ: Yes, as I mentioned, you fill
10 up the monitoring tank, then that's a batch that
11 leaves the tank.

12 MEMBER RYAN: Okay.

13 MR. PEREZ: Okay, for the liquid waste
14 management system, I have a little pictorial here of
15 the evaporator. The evaporator is a Group I waste.
16 The waste room comes in through a preheater into an
17 evaporator column, where you start to have separation
18 and start to develop the evaporator bottoms. And this
19 is a vapor compressor with forced recirculation that
20 recovered some of the energy in the evaporation
21 process. So from the vapor and the vapor column, you
22 compress the vapor through a heat exchanger, and then
23 you go back, recover that energy into the evaporator
24 column, and the bottoms pick up that energy, and keep
25 going through the evaporator column, building up the

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 bottoms, the bottoms are collected into the
2 concentrate storage tank, and the clean distillate is
3 collected in the distillate tank. The energy in that
4 distillate is actually used to preheat the incoming
5 influent. So that is the design of the evaporator.

6 MEMBER BANERJEE: So what forms at the
7 bottoms?

8 MR. PEREZ: Slurry that need to be
9 solidified later.

10 MEMBER BANERJEE: What is the typical
11 volume fractions? Is it pretty thick stuff?

12 MR. PEREZ: It's pretty thick stuff. I
13 don't have the exact fraction, but I can tell you it's
14 technically pretty thick stuff.

15 MEMBER BANERJEE: Then you evaporate and
16 calcine it?

17 MR. PEREZ: Well, because it will drum
18 dryer, which I will discuss in Section 11.4, where
19 there you start to dry these bottoms. And I will
20 discuss that when we get into solid waste.

21 MEMBER STETKAR: Pedro - if you are more
22 concerned - I'm going to get into equipment, so if you
23 are more concerned about what's going on.

24 MEMBER BANERJEE: Well, I'm just
25 concerned, if it starts to get clogged and things like

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 this, this line, how do you take care of that?

2 MR. PEREZ: Good question. There are
3 chemicals added to this process to prevent solids to
4 be aggregated. And it's also other chemicals to
5 address cleaning of the internals. So there is no -
6 it's a very highly resistant stainless steel. It does
7 require that you have deposits that can get basically
8 stuck to the wall; there is chemistry that is added to
9 keep things in solution and basically keep the system
10 clean.

11 MEMBER BANERJEE: But these are solids,
12 right? So they don't go in solution.

13 MR. PEREZ: Correct, but the bottom is a
14 slurry.

15 MEMBER BANERJEE: Yes, it's a slurry. So
16 how do you ensure that it remains a slurry and doesn't
17 form a cake?

18 MR. PEREZ: Well, you control the
19 chemistry, and you control how often you keep
20 recirculating.

21 MEMBER BANERJEE: Is this a well
22 established process that everybody does?

23 MR. PEREZ: Yes. Not everybody, but it
24 has considerable operating history.

25 MEMBER BANERJEE: You know you can keep

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 it as a slurry?

2 MR. PEREZ: Yes. Yes, there are not many
3 in operation in the U.S. This design of vapor
4 compressor with forced recirculation is more popular
5 in Germany, for example, and it has been ported to
6 other parts of the world.

7 MEMBER STETKAR: So you have exactly one
8 of these things, right?

9 MR. PEREZ: Yes.

10 MEMBER STETKAR: In the plant.

11 MR. PEREZ: Yes.

12 MEMBER STETKAR: What has been the
13 operating experience? Because as you mentioned this
14 is a little bit different machine than typical
15 operating U.S. plants. What has been the operating
16 experience for these machines? How reliable have they
17 been? How frequently do they fail? To back up into
18 the tanks or bring in portable equipment?

19 MR. PEREZ: Okay, let me take that. I do
20 not have a failure rate. I can give you these
21 machines have been used for 40 years, a total of 400
22 reactor years of operation. I have looked at the
23 effluent from plants that use this technology,
24 normalized it to curies per megawatt basically, and
25 for those plants I saw very clean effluents.

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 MEMBER STETKAR: That's not what I was
2 asking. I was asking how frequently does it fail, and
3 do you back up into requiring filling up the hold up
4 tanks, storage tanks, or bringing in portable
5 equipment -

6 MR. PEREZ: Right, I was going to go the
7 second. Based on this, and I looked at 10 years worth
8 of history, that's all I did, 10 years, it looked
9 reliable in that 10 years. Okay? Every effluent I
10 looked at. I also realized - I also realized in
11 saying this, only one of these things, okay. So we
12 also have this design, the demineralizer, in the event
13 you do have the maintenance, you do have the
14 capability, the flexibility, to kick in a demin system
15 during that time that the system may be out.

16 MEMBER STETKAR: What I am trying to get
17 to is the reliability of the design systems versus the
18 need to use additional portable demineralizers, flow
19 through units and such to process the volume of the
20 waste. As I said I grew up in a plant where we had
21 substantial problems with handling the actual volume
22 of waste given the design of the - the amount of
23 equipment we had piped into the design if you will,
24 and the reliability of that equipment. We actually
25 were able to handle the waste, but from an operational

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 perspective, we needed an awful lot of portable
2 demineralizers. We needed to dispose of an awful lot
3 of portable resin beds and things like that that were
4 not part of the original design. Like we had a lot of
5 hoses piped around our auxiliary building to handle
6 this stuff. Indeed our releases stayed within limits.

7 We were eventually able to handle the waste, but it
8 was not something that was particularly good for
9 operations.

10 So I'm more concerned with how frequently
11 could plants be challenged to establish that type of
12 alternative waste processing mode to keep ahead of the
13 flow stream.

14 MEMBER RYAN: I share John's question,
15 and it kind of comes to me from the figures you gave
16 for the Group I, II and II holdup times that you have.

17 MR. PEREZ: Yes.

18 MEMBER RYAN: You have a week's worth of
19 capacity, so if there is a maintenance issue of any
20 kind in the system, and you can't deal with it in a
21 week, all of a sudden you have to look for
22 alternatives in how to manage that waste.

23 So I think maybe there is a homework
24 question to kind of lay out how the time reactions to
25 any kind of a failure that challenged your holding

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 capacity, how they would be handled.

2 MR. PEREZ: Okay.

3 MEMBER RYAN: And that's kind of the
4 theoretical part. The second part is in an operating
5 plant have they had those circumstances, and if they
6 have, how are they handled? That would be a good way
7 for us to get an understanding.

8 MR. PEREZ: Correct.

9 MEMBER STETKAR: By the way, I think they
10 have bigger holdup capacity for the Group I and II.
11 They've got a --

12 MEMBER RYAN: Two weeks plus.

13 MEMBER STETKAR: -- two weeks plus.
14 Another week for the Group III. Two plus weeks of
15 waste.

16 MR. PEREZ: Okay, what I'm taking is to
17 get you the reliability of the evaporator, and what
18 happens when that evaporator is out.

19 MEMBER RYAN: What is the sequence of if
20 you do have a problem, where it is the evaporator or
21 whatever it might be, and you have to stop dealing
22 with your two-plus weeks of waste, some other way with
23 an alternate system, how would you go about it.

24 MR. PEREZ: Okay, and I think I can
25 answer that question because the demineralizer is not

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 a temporary thing; it's installed. So you could
2 tailor, you can tailor that demin should the system
3 fail, that's how I would handle it.

4 MEMBER STETKAR: You're going to be
5 saturating your resin beds a lot quicker, and
6 depending on how long this is out. You can push it
7 downstream but you are still going to be taxing that
8 system, because it's designed to handle effluent from
9 evaporator.

10 MR. PEREZ: Right. So we will look for
11 that reliability of the evaporator.

12 MEMBER STETKAR: It's basically operating
13 experience, since as you said it's been installed in
14 German plants. It's not something that is easily
15 retrievable from licensing information, unfortunately.

16 You need to kind of go back to the users and see what
17 they're experiencing.

18 MR. PEREZ: And we may have that value,
19 and that's why I'm asking. We'll get an answer.

20 MEMBER BANERJEE: What type of a system
21 do they use here?

22 MR. PEREZ: Well, there are some plants
23 that have used evaporators, and one as we've talked
24 before, the question is where does the waste go to?
25 Sometimes it's driven by your disposal options as to

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 the technology. So the U.S. has experience with
2 evaporators. The early experience wasn't very good.

3 Others have done very well with
4 evaporators from an ALARA perspective. EPRI did some
5 studies at a power plant in Virginia that again was
6 having some issues with evaporator bottoms, what to do
7 with them, and realized gee, that evaporator was doing
8 very good, from an ALARA perspective effluent.

9 So now, right now most of the U.S. plants
10 like to see demin skids. Reverse osmosis is coming
11 into play.

12 MEMBER RYAN: I was going to say, RO is
13 really coming along.

14 MR. PEREZ: Again EPRI has done some
15 interesting work with that. So where we are going to
16 be in five years or so, really we'll look at where is
17 the disposal going.

18 MEMBER BANERJEE: The only thing about
19 this that I would comment is that you've got a vapor
20 compressor which is a complicated piece of equipment,
21 and heat recovery in this system is quite a trick. So
22 I'm just wondering what drives you to these systems
23 rather than things like reverse osmosis, which are in
24 some ways much more straightforward.

25 MR. PEREZ: That is the influence of the

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 designer. The European experience has been very
2 positive with this technology so it was carried over.

3 That is the driver.

4 CHAIR POWERS: The German guys do it and
5 they like it.

6 MEMBER BANERJEE: The vapor compressor is
7 a mess.

8 MR. PEREZ: Okay, the evaporator operates
9 in batch mode as we discussed. It processes about
10 1,050 gallons per hour. The decontamination factor,
11 the DF, can range from 10 to the 4th to 10 to the 7th,
12 it has a very high DF, and volatiles elements, such as
13 halogens, have a DF of 10 to the 4th, so for iodine,
14 it would be 10 to the 4th.

15 Other nuclides, cesium, cobalt-60,
16 strontium-90, manganese can reach 10 to the 7th. We
17 did for analysis - I'll explain that later - we used
18 the lowest range of these DFs for the GALE
19 evaluations.

20 Now the centrifuge, remember, is supposed
21 to have high - higher solids. It has a decanter that
22 removes from the effluent stream the heavy particles.

23 So the solids collect in a release container. And
24 then the more clean liquid goes into the separator,
25 that's actually a centrifuge, and from there you have

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 to purify water. What's left goes into a slurry tank,
2 and ultimately it's collected, solidified, in the
3 solid waste system.

4 So this is a simpler system.

5 MEMBER STETKAR: Pedro, do the operating
6 training plants also have the centrifuges installed?

7 MR. PEREZ: Yes, not all of them. Not
8 all.

9 MEMBER STETKAR: Same question applies
10 for them, because the centrifuge is typically a fairly
11 high maintenance item. And here you start overloading
12 the evaporator.

13 MR. PEREZ: And as I mentioned before -
14 or as I will mention next, you really don't get too
15 much of a DF from these. So these are just basically
16 removing high solids in the waste stream.

17 MEMBER STETKAR: You will get a lot more
18 solids in the bottoms of your evaporator.

19 MR. PEREZ: Like the evaporator is a
20 process a batch mode. It can process up to 1,300
21 gallons per hour. And the DFs just 10 to the 1st or
22 10 to the 2nd. So it didn't do much from a DF
23 perspective.

24 MEMBER RYAN: How dry is the solid coming
25 out of the decanter?

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 MR. PEREZ: Do you know that answer, how
2 dry is the solid? We'll get that answer.

3 MR. SCHMIESING: My name is Craig
4 Schmiesing with AREVA NP. It should be the same
5 consistency as the concentrates from the evaporator
6 bottoms.

7 MEMBER RYAN: So is it fairly reasonable
8 liquid content. Still, it is not dry?

9 MR. SCHMIESING: Correct. We have some
10 place the water content.

11 MEMBER RYAN: It needs further treatment
12 before it's ready for disposal, I guess?

13 MR. PEREZ: Yes.

14 MEMBER RYAN: All right, that's really my
15 question. This waste container is really not a
16 disposal container.

17 MR. PEREZ: No, it's not.

18 MEMBER RYAN: It's an intermediate
19 container.

20 MR. PEREZ: Yes, exactly.

21 MEMBER RYAN: Okay.

22 MR. PEREZ: As I mentioned previously
23 demineralizers are very commonly used in the United
24 States. The resin bed configuration, you can tailor
25 the combination of resins for what you have in the

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 incoming influent. What we have in design
2 certification is a system that can process 2,400
3 gallons per hour, which is pretty high capacity in
4 case the evaporator centrifuges have an issue. But
5 the DFs in the analysis only range from 10 to the 1st
6 to 10 to the 3rd. And again, we didn't - in the
7 analysis, we didn't tailor, we just used a common
8 range of DF values.

9 From GALE you obtain the annual liquid
10 effluents, the activities in curies per year. That is
11 the input among other things for the LADTAP II code.
12 We also took the GALE results and converted the
13 activity to concentrations, effluent concentrations.
14 First there's a realistic first term concentration
15 comparison to things 10 CFR 20. And that
16 concentration is then scaled up to the one percent
17 fail fuel fraction to obtain a design basis effluent
18 concentration. So this is what is going into the
19 environment as calculated by LADTAP - excuse me, by
20 GALE.

21 LADTAP provides the maximum exposed
22 individual dose and demonstrates compliance with the
23 dose objectives of 10 CFR 50 Appendix I.

24 We also performed intensification a
25 demonstrative population dose for a cost benefit

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 analysis. Hypothetical sites were considered in the
2 design certification, and population dose and cost
3 benefit are COL items. We will do in DC just to
4 demonstrate a methodology for performing. But the
5 actual site has to be included.

6 LADTAP II, the inputs are in the FSAR
7 Table 11.2-5. You had the maximally exposed
8 individual, and as I mentioned, the allowable doses
9 demonstrate compliance with 50 Appendix I dose
10 objectives.

11 We assume a freshwater site to maximize
12 the intake of contaminated vegetation, animal, et
13 cetera. As I mentioned in site parameters, an
14 effective discharge pollution flow of 100 feet per
15 second is assumed, and just for the demonstration
16 maximum exposed individual site parameters are listed
17 in the FSAR 11.2, Table 5. And as I mentioned, this
18 is a COL item.

19 So results for the maximally exposed
20 individual to demonstrate compliance with Appendix I,
21 the total body, the child group, 2.2 units per year;
22 the dose objective is three. Recalling that we had
23 maximized this site, this hypothetical site, to take
24 into consideration all possible pathways. In the
25 organ dose is the infant thyroid at almost five units

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 per year; where the objective is 10. And of course
2 when the plant is operating you have the offsite dose
3 calculation manual that collects all of the effluent
4 information and performs the actual calculations of
5 what the effluents - the effect on the environment.
6 That is a COL item.

7 The population dose was performed to look
8 at do we even need the demineralizer. So we looked at
9 a case, just the evaporator, another case with
10 evaporator and demineralizer, and what we found was a
11 benefit-cost ratio of 0.12 based on thyroid dose which
12 is less than one. So the evaporator by itself is
13 doing a pretty good job. The demineralizer is
14 polishing where the evaporator effluent was.
15 Nevertheless, because of the reliability issues,
16 because of reliability concerns, we added to the
17 signed certification the demineralizer system.

18 So you do not need it from a cost-benefit
19 perspective, but from operational flexibility we
20 recognized it's a good idea.

21 MEMBER STETKAR: But that puts the onus
22 on that evaporator?

23 MR. PEREZ: Yes.

24 MEMBER STETKAR: Okay.

25 MR. PEREZ: The GALE-L effluent

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 concentrations as I mentioned we had the realistic
2 source term concentrations, and we wanted to look at
3 what was the maximum concentration we could expect at
4 the site boundary. Here we are seeing a dilution
5 factor of 9,000 gallons per minute. Again to maximize
6 that concentration, and it reflects a cooling tower
7 blowdown. The results show the sum of the ratios of
8 the effluents released, the concentration limits for
9 the expected release is 0.12, well below 1.0, and for
10 the design basis it's 0.62. As a one percent failed
11 fuel you still have a design basis release of 0.62,
12 but again, the clean up system is doing its job.
13 Realistically, 0.12, design basis, one percent, .62,
14 and the goal here will show that you have that
15 capability.

16 You are going to see the same later with
17 the gaseous.

18 We performed an abnormal operational
19 occurrences. We looked at 10 CFR 20.1406 from a
20 spread of contamination perspective. We looked at
21 pipe leaks and breaks. The liquids from leakage or
22 pipe breaks in the system are collected by sumps in
23 the lowest part of the building, and failures of
24 vessels, tanks and pumps, rooms which contain storage
25 and concentrate tanks are capable to hold the contents

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 of a complete tank, and they are segregated by
2 compartment. The rooms are connected to waste
3 classification and leakage sensors monitor each waste
4 group.

5 MEMBER STETKAR: Pedro, is the piping
6 between the containment and the auxiliary building,
7 the radwaste building, underground, or is it routed
8 above ground through buildings?

9 MR. PEREZ: There are underground --

10 MEMBER STETKAR: I'm talking about
11 between containment, the input to the radwaste program
12 first. I know the effluent must be underground
13 eventually.

14 MR. PEREZ: Do you mean under - between
15 the buildings? Yes, we will give you an answer.

16 MEMBER STETKAR: You obviously know the
17 reason for the question.

18 MR. PEREZ: And I will mention in a
19 second the areas on which we focused in radiation
20 protection have been the sumps, the lower sumps, and
21 ensuring those are double-walled and pipes are double
22 walled, and you have leakage, you can actually inspect
23 sumps.

24 MEMBER STETKAR: But you can actually
25 inspect sumps and what comes out of those sumps

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 whether you can inspect that piping, especially since
2 you are looking at a 60-year life on this machine, and
3 if it's underneath buildings --

4 MR. PEREZ: Exactly, we have done a very
5 conscious effort through an ALARA review to look at
6 any piping, to the point of detecting an electrical
7 conduit or fire by the a system warning. And between
8 the buildings right now - we will get you that answer,
9 but I fully understand the question and I expect the
10 question.

11 MEMBER BANERJEE: So a leakage sensor,
12 you say. What type of leakage sensor is that?

13 MR. PEREZ: It will be like a moisture
14 detector between two -- an airspace, so that if you
15 have water being collected in that space a sensor will
16 go on. The last time I was here I mentioned to the
17 committee that for example in my basement I have my
18 hot water heater, I have a monitor on the floor, so if
19 that water heater starts to leak, the moisture, that
20 sensor will go off. So basically it's a motion sensor
21 between an airspace, to warn - to warn the operator
22 that, yes, there is a leak there. Because what's
23 interesting is, if you have multiple barriers, they
24 can be leaking, you may not know it. And we have
25 experience with that, industry has experience with

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 that.

2 MEMBER BANERJEE: So the in-service
3 leakage sensor is not for buried pipes and things?

4 MR. PEREZ: Well, it can be, because a
5 pipe will be double walled. So you can have a buried
6 pipe, for example, leaving the building, the waste
7 building, out to the environmental discharge point,
8 that's a buried pipe, if it is a double walled pipe,
9 and it will have leakage-detection capability, so you
10 will know if there is a breach of the inner pipe.
11 Then if that happens you will have to excavate and fix
12 that problem. And the key here --

13 MEMBER BANERJEE: How large a leak will it
14 be able to detect?

15 MR. PEREZ: That I do not know.

16 MEMBER RYAN: One of the things, just to
17 follow up on Sanjoy's question, I appreciate the
18 monitoring problem that you were describing, but how
19 about the remediation part? A lot of times these have
20 become huge projects to try and address a leak well
21 after the leak has started. So are you taking that
22 into account?

23 MR. PEREZ: That depends on the site,
24 because depending on how the piping is routed, okay,
25 there will be different options.

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 MEMBER RYAN: Yes, with the physics.

2 MR. PEREZ: So I have not within my scope
3 looked at remediation, but I am very aware of that.

4 MR. SALAS: That would be one item that
5 will be handled by the COL, and it will be part of --
6 be consistent with the industry initiative that is
7 currently underway, that triggers what remediation
8 needs to take place.

9 MEMBER RYAN: Thank you.

10 MEMBER STETKAR: But as far as the design
11 is concerned, the design does specify double-walled
12 pipe with some type of leakage monitoring system?

13 MR. PEREZ: Yes, and then the question of
14 how sensitive is it, I don't have that information.

15 MEMBER BANERJEE: And this is all buried
16 piping which might be containing radionuclides in the
17 flow?

18 MR. PEREZ: That is correct.

19 MEMBER BANERJEE: All are double walled?

20 MR. PEREZ: Or they are in a trench,
21 okay. The key here is to separate the reactor
22 material with at least two barriers from the
23 environment. And then have leak detection between the
24 two barriers. So that can be a pipe within a pipe, or
25 a pipe in a trench, with leakage detection.

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 MEMBER BANERJEE: I take it those
2 requirements were spelled out in Chapter 12, right?

3 MR. PEREZ: Correct.

4 MEMBER BANERJEE: And the trench wall is
5 made of what?

6 MR. PEREZ: It depends on where it is.
7 It typically will be a concrete, like a concrete --

8 MEMBER RYAN: A chase.

9 MR. PEREZ: A chase, like a pipe chase.

10 We preformed the RW-IIa evaluation. We
11 also looked at what were the effluents at the site
12 boundary, so that would be the only restricted area of
13 water concentration from unmitigated liquid releases.

14 We followed Branch Technical Position 11-6, and
15 recent DC/COL Interim Staff Guidance -013 and -014,
16 dealing with source term assumptions basically. We
17 basically looked at the total release of five tanks.
18 We looked at concentration at an area immediately in
19 the vicinity of the discharge point. What we noticed
20 that these were using some site characteristic for
21 ground transportation. We looked at just basically
22 tritium, iron-55 and cobalt-60, as the only
23 significant nuclides. The other ones were very low.

24 MEMBER RYAN: Significant in terms of,
25 what, concentration or contribution to dose or what?

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 MR. PEREZ: Concentrations. This was
2 strictly looking at concentrations. And in the FSAR
3 11.2-8, we demonstrate this has a compliance with 10
4 CFR 20 Appendix B. And again these were generic site
5 considerations.

6 MEMBER RYAN: Did you think about there
7 might be other radionuclides that might be dose
8 significant that might not be activity significant?

9 MR. PEREZ: Yes, yes. And we did do site
10 specific calculations, where we included everything.
11 But there we needed the site characteristics.

12 MEMBER RYAN: So that would be a COL item
13 too?

14 MR. SALAS: Yes, I think the calculations
15 you are referring to are the COL applications.

16 MR. PEREZ: Yes.

17 MEMBER RYAN: Thanks.

18 MR. PEREZ: Like with liquid waste, we
19 looked at the gaseous waste processing system. It is
20 described in 11.3. This is a very common system. It
21 collects, processes and discharges gaseous waste. It
22 maintains ALARA dosage controls. It also controls
23 explosive gases, by limiting the concentration of
24 oxygen and hydrogen to less than - oxygen is less than
25 2 percent and hydrogen is less than 4.

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 And like the liquid waste, we have
2 classified this as RW-IIa. It consists of obtaining
3 any gaseous waste from taking sources through the
4 reactor building, fuel building, safeguard building,
5 mechanical areas, nuclear auxiliary buildings. It
6 collects through the system, recombining hydrogen,
7 oxygen, and then drawing the gas, and then through
8 delay beds, three delay beds, charcoal delay beds, we
9 have hold on xenon and krypton and ultimately all the
10 discharges are through the plant stacks.

11 MEMBER BANERJEE: So what is the typical
12 composition of the gas entering the recombiner, give
13 me a range? How much hydrogen, how much oxygen, how
14 much other stuff?

15 MR. PEREZ: Okay, the hydrogen
16 concentration - I can tell you how much krypton goes
17 in, but hydrogen, I need that looked up. What is the
18 hydrogen concentration.

19 MEMBER BANERJEE: Hydrogen and oxygen.
20 That's what's being recombined, right?

21 MR. PEREZ: Right, that's what's being
22 recombined.

23 MEMBER BANERJEE: So, that is what sets
24 the size of your recombiner.

25 MR. PEREZ: Yes. So what are the expected

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 hydrogen-oxygen concentrations from like the volume
2 control tank and all these other collection points.
3 We will get you that answer.

4 MEMBER BANERJEE: And also I guess how
5 much of the stuff is in any container. Hydrogen and
6 oxygen in particular.

7 MR. PEREZ: Throughout the plant?

8 MEMBER BANERJEE: Well, wherever - I mean
9 it's where you've got the highest concentrations of
10 these noncondensibles.

11 MR. PEREZ: Okay.

12 MEMBER BANERJEE: Because my concern is
13 that in several areas you could have things which
14 potentially could form a small explosion or something.
15 It's happened before.

16 MR. PEREZ: Yes. In PWRs, I don't know.

17 MEMBER BANERJEE: Well, basically not,
18 but just for information it would be useful to know.

19 MR. PEREZ: Okay, we will get you that
20 answer.

21 So the maximum hydrogen-oxygen
22 concentrations that are being collected.

23 MEMBER BANERJEE: And volumes. The
24 maximum volumes.

25 MR. PEREZ: Okay.

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 MEMBER STETKAR: Pedro, back to
2 equipment, I note the recombining in the piping of
3 ductwork, however it's piped up, is not explosion
4 proof. You take the approach of designing against a
5 detonable mixture.

6 MR. PEREZ: Yes.

7 MEMBER STETKAR: Without going into too
8 many design details, are all of the - unless they are
9 all air-operated valves in that system - do they all
10 fail closed on massive air pressure and things like
11 that? The FSAR talks an awful lot about controls. It
12 talks an awful lot about how the system works. It
13 talks about preventing isolation. I was just curious:
14 what position do they go to when you lose air
15 pressure? Since they are air-operated, and you lose
16 air?

17 MR. PEREZ: Yes. Do you know? Do you
18 know the answer, when you lose air, instrument air,
19 where do the valves fail to?

20 MR. SCHMIESING: Not off the top of my
21 head.

22 MR. PEREZ: I'm not sure we can say all
23 valves.

24 MEMBER STETKAR: You know, they are
25 hydrogen and oxygen additions, so you get the right

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 mixtures, the recombiner, and the inlet and outlet
2 valves on the recombiner itself. You get the flow
3 stream isolation valves on the recombiner.

4 MR. PEREZ: Okay, so the focus is on the
5 recombiner.

6 MEMBER STETKAR: Yes, what happens when
7 you lose air. Here is what I'm concerned about, not
8 getting hydrogen and oxygen together for example.

9 MR. PEREZ: Okay.

10 CHAIR POWERS: The control problem of
11 systems is the oxygen bottle that is connected to the
12 nitrogen inlet, and it blows up on grease. The usual
13 problem with those systems is that the oxygen bottle
14 gets connected to the nitrogen inlet and it blows up
15 on grease.

16 You can lubricate nitrogen valves. It's
17 usually handled just by making them different
18 connectors.

19 MEMBER STETKAR: Incompatible connectors,
20 but it happens.

21 MR. PEREZ: The gaseous waste system, the
22 modes of operation, you have the normal mode most of
23 the time, routine operation. No significant gas
24 releases to the auxiliary building ventilation system.

25 Now during surge mode of operation, it's only about 1

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 percent of the systems, normal operating time. And
2 it's during plant start-up, due to the expansion of
3 water from the primary circuit reducing free gas
4 volumes in the coolant storage tanks and you vent that
5 gas to the gaseous waste system. During outage
6 preparation, for example, draining the reactor cooling
7 system, we have excess gas generated from
8 degasification of the reactor coolant that is sent to
9 the gaseous waste system.

10 So routine operation, not much. It's when
11 you go into the outage and start up and shut down.
12 The delay beds, as I mentioned, very common, retaining
13 xenon and krypton in activated charcoal media. They
14 have three vertical vessels with a carrier gas of
15 nitrogen, about 7 cubic feet per minute. Charcoal
16 mass is 5,440 pound-mass per bed and that provides you
17 a hold up time for xenon of 27.7 days and hold-up for
18 krypton is 40 hours. And these are the inputs that
19 will go into the GALE code.

20 MEMBER BANERJEE: 27.7 is a precise
21 number, considering what I know about these things.

22 (Laughter.)

23 MR. PEREZ: It is a simple calculation.
24 If you want, we could convert back to hours and I will
25 give you just one whole number.

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 MEMBER BANERJEE: Oh, okay, hours is a
2 whole number.

3 MR. PEREZ: Yes, because here 40 hours.
4 Here is 27.7 days. I can multiple that time 24 and
5 give you -- you know what I'm saying?

6 CHAIR POWERS: It's still going to be a
7 very precise number. But it's just one over the decay
8 constant for evaporation, is all that is.

9 MR. PEREZ: How long it takes for the
10 charcoal mass to absorb this volume of gas.

11 CHAIR POWERS: So it's the desorption?

12 MR. PEREZ: Yes.

13 CHAIR POWERS: The desorption coefficient
14 for whatever charcoal you have.

15 MR. PEREZ: As I mentioned, this is now
16 in parallel to the liquid. We did exactly what we did
17 in liquid and gaseous. We looked at realistic source
18 terms. We looked at 1 percent failed fuel. We looked
19 at Appendix Bravo concentrations for both. We did the
20 maximally exposed individual doses. The key GALE-G
21 inputs are the following: HEPA filters assumed to be
22 99 percent efficient, charcoal efficiency of 90
23 percent. I mentioned the hold-up times. The
24 containment free volume of 2.8 million cubic feet.
25 And within the reactor building, you have what is

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 called a kidney filter. There are two compartments in
2 the reactor building, in the equipment compartment and
3 another compartment that can be accessed during power.

4 And you have a kidney filter processing 4.1 cubic
5 feet per minute cleaning up, okay, that internal free
6 space and we have a containment -- we assumed a
7 containment purge flow rate of 3210 cubic feet per
8 minute. I write here, RAI 273 because in the FSAR
9 right now what you have is an analysis done with 2970
10 cfm. And what happened to us, we looked at the design
11 maximum supply, and that's 2970. We should have
12 looked at design maximum exhaust. The delta is
13 insignificant when you look at the doses. It's in the
14 decimal places. But that was corrected from an RAI.

15 And we also did not include an air ejector
16 effluent treatment, no filters. That's the GALE. The
17 effluent releases from the stack, we looked at an
18 elevation of about 200 feet from plant grade and about
19 7 feet above the reactor building with a stack flow
20 rate of 240,000 cubic feet per minute. Again this is
21 Chapter 11, where you can take credit for elevated
22 releases. Later on, for the design basis accident,
23 no, it's ground level release. But for normal
24 effluent, we do credit the elevated release.

25 Atmospheric dispersion and ground

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 deposition, chi over q, d over q factors are based on
2 conservative values at half a mile from the reactor
3 building centerline which is the boundary, site
4 boundary and we assume a mixed-mode release.

5 Exposure pathways: we looked at external
6 exposure from contaminated ground, external exposure
7 from the overhead plume, inhalation, ingestion of
8 vegetables, milk, meat, water. And the GASPAR II
9 results for the MEI, these are basically the
10 calculated values and here you have your 10 CFR 50
11 Appendix I dose objectives. As I mentioned earlier,
12 part of an operating plant, you have an ODCM that is
13 collecting all this information, both liquid and
14 gaseous, to give you your annual effluent reports. So
15 the ODCM is a COL item.

16 We also perform a population dose for the
17 sole purpose of a cost-benefit analysis. We look for
18 stack releases, and again we looked at the same
19 exposure pathways. And here we looked at a base case
20 of three delay beds, and we looked at adding a fourth
21 delay bed. The dose ratio was only .05, based on
22 thyroid, and the expense of modifying the building and
23 adding that delay bed did not justify adding the delay
24 bed.

25 CHAIR POWERS: Because you don't any

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 delay in krypton and the xenon half life is too long
2 for you.

3 MR. PEREZ: Exactly, it was not benefit
4 whatsoever.

5 CHAIR POWERS: It would be interesting to
6 look at what a cryoscopic system, where you would
7 actually freeze the material out to give you long
8 enough decay time to get some advantage. I have no
9 idea what that would cost.

10 (Laughter)

11 There are product manufacturers and
12 delivers them to your site a turnkey operation and
13 things like that. But I just don't know. But an
14 additional delay bed is going to give you nothing.

15 MR. PEREZ: And I will mention that,
16 after all this, the highest contributor is krypton-85,
17 when you look at the effluents from the plant.

18 And again as I mentioned, we looked at the
19 concentrations, the Appendix Bravo Table 2
20 concentrations, looking at the annual average at .5
21 miles from the reactor centerline. And these results
22 compare very favorable to some of the ratios for
23 normal gaseous concentrations is only .02, and even
24 with a 1 percent failed fuel assumption, it's .1. And
25 again, both well below 1.0.

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 We looked at radioactive gas system leak
2 or failure. As was mentioned earlier we have
3 pressurized sections that are designed with a high
4 degree of leak-tightness. For example liquid ring
5 compressors are used to avoid an ignition source, and
6 canned motor guarantees a sealed motor compressor.
7 Some parts of the system are sub-atmospheric to
8 prevent leakages and hydrogen interaction
9 concentrations are controlled to prevent detonation.

10 We performed a bounding analysis that
11 looked at an operator error leading to bypassing a
12 delay bed and releasing the effluent from the coolant
13 degasification system for one hour. It assumes that
14 no one noticed it and you just are venting for one
15 hour. Based on this one-hour release, the exclusion
16 area boundary dose is less than 100 millirem in
17 accordance with the Branch Technical Position 11-5.

18 Solid waste management looks at processing
19 radioactive concentrate, solid waste processing
20 system, solid waste storage system.

21 Processes concentrates from the evaporator
22 bottom, process sludge from storage tank bottoms, and
23 process spent resin from primary and secondary coolant
24 purification as well as the liquid waste demineralizer
25 systems.

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 Solid waste volume reduction includes
2 shredding, solid waste brine, compaction, and a
3 sorting box. A drum storage room for low-activity
4 waste in drums is available. A concrete tubular shaft
5 storage area for medium- and higher-activity waste.
6 And we have several years' storage capacity for Type B
7 and C waste in the plant.

8 MEMBER RYAN: How much volume are you
9 planning on in that storage facility?

10 MR. PEREZ: Let me say first the storage
11 capacity is 7-1/2 years and the volume is -- the total
12 volume of Type B and C waste that use that 7.5-year --
13 okay, we can get that.

14 MEMBER RYAN: I'm curious about the
15 volume number, because that's really the limit, not
16 the time; sometimes they get used up faster than
17 expected.

18 MR. PEREZ: Got it.

19 And the PCP, the Process Control Program,
20 is a COL item. This is from one of the Chapter 12
21 drawings, showing that section of the waste building
22 in the lowest elevation where you have the above-grade
23 storage area and you have the tubular shafts, storage
24 storage drums.

25 MEMBER RYAN: How high are those tubular

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 storage --

2 MR. PEREZ: Up to five drums.

3 MEMBER RYAN: Five drums.

4 MR. PEREZ: I had here five drums' high.

5 MEMBER RYAN: Oh, I'm sorry.

6 MR. PEREZ: 11.5, we look at effluent
7 radiological monitoring and sampling. Gaseous
8 effluents from the reactor building, fuel building,
9 nuclear auxiliary, safeguard building mechanical area,
10 radioactive waste processing building, controlled
11 areas of the access building, condenser air ejector --
12 all of these have gaseous effluents. They are venting
13 via the vent stack. At the vent stack you monitor
14 noble gas activity, both gamma and beta detectors,
15 aerosol activity, it detects iodine, activity is
16 monitored by a dual filter for organic and inorganic
17 iodine.

18 So all these effluents are collected by
19 the different HVAC systems, routed to the vent stack,
20 and from there you have the release, the monitored
21 release.

22 The effluent radiological monitoring and
23 sampling again concentrations show that you meet 10
24 CFR 20 Appendix Bravo. Effluents meet the ALARA
25 design objectives of 10 CFR 50 Appendix I. These are

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 also used in doses to show you meet the EPA site 40
2 CFR 190. So you need the site. You need to know if
3 there are other facilities at that site.

4 MEMBER STETKAR: Pedro, let me -- you're
5 speaking faster than I can think, which is not
6 difficult.

7 (Laughter)

8 You mentioned the condenser air ejectors
9 are exhausted back to the vent stack. Are all turbine
10 building exhausts that could come into contact with
11 potentially active gases routed to the vent stack?
12 I'm thinking of things like gland seal exhausters.

13 MR. PEREZ: I know where you are going.
14 The turbine building, that -- I can't answer that
15 right now.

16 MEMBER STETKAR: I'm not talking about
17 normal turbine building vents, but things you look at
18 are condenser air ejectors, gland seal -- turbine
19 gland seal exhausters, you know, that can get exposed
20 to steam.

21 MR. PEREZ: Yes, the air ejector, of
22 course, because of the volume --

23 MEMBER STETKAR: Yes.

24 MR. PEREZ: I tracked it. The others, I
25 don't know right now.

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 MEMBER STETKAR: I haven't looked at the
2 secondary side of the plant to see how you are piped
3 up, but typically you'll have gland seal exhausters
4 and -- I'm not thinking fast enough to identify
5 another one, but gland seal is one that comes to mind.

6 MR. PEREZ: So the question is basically
7 all the turbine --

8 MEMBER STETKAR: Anything that could be
9 exposed to active steam.

10 MR. PEREZ: Yes.

11 MEMBER STETKAR: If you have it.

12 MR. PEREZ: We'll work on that answer.

13 MEMBER RAY: Have you ever seen those
14 monitored, John, from the steam supply itself?

15 MEMBER STETKAR: No, not separately.
16 That doesn't mean somebody hasn't tried it.

17 MEMBER RAY: I was just interested if you
18 had.

19 MR. PEREZ: Okay, and as I mentioned,
20 basically, these instruments provide the ODCM inputs
21 in addition to offsite monitoring and to support the
22 preparation of effluent reports.

23 Process monitoring and sampling: this is
24 where you want to detect the migration of radioactive
25 materials from a contaminated area to a clean area,

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 consistent with 10 CFR 20.1406, you want to know how
2 the material may be moving around the plant. It
3 supports maintaining occupational and off-site doses
4 ALARA. The process monitors main steam radiation and
5 is the primary indication of a steam generator tube
6 rupture. By looking at, for example, N-16 and krypton
7 or whatever else may be leaking into that generator.

8 Steam generator blow-down system, is a
9 secondary means of detecting steam generator tube
10 rupture and provides chemical analysis of your steam
11 generator. Condenser air removal has a radiation
12 monitor and all the noble gas activity.

13 Component cooling water radiation
14 monitoring system, here we are looking at coolers or
15 heat exchangers to check the integrity of it, to make
16 sure that barrier is not lost. Or if it is noticed,
17 then you have to take into account repairs.

18 We look at gaseous waste disposal
19 radiation monitoring systems, delayed bed monitoring
20 downstream and upstream, to make sure the delay beds
21 are working properly. Reactor coolant radiation
22 monitoring and sampling, cooling gas, noble gas
23 activity, to check your iodine dose-equivalent values.

24 Similarly chilled water supply for the
25 gaseous waste disposal sampling systems. You monitor

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 the integrity of the components such as heat
2 exchangers. So we have a considerable detections
3 around areas where you could have a barrier breach
4 that then transports radioactive material to a clean
5 area.

6 And we do have some automatic protective
7 actions, for example, containment high range monitors
8 feed into reactor building isolation. Fuel building
9 air exhaust monitor feeds into a signal to close up
10 the fuel building and go into recirculation mode.
11 And the main control room air intake monitors look for
12 activity in the Main Control Room air to go from
13 normal mode of operation to a recirculation mode for
14 control room habitability.

15 MEMBER RYAN: One of the things on that
16 page you haven't touched on so much is that second
17 part of 1406 which is the ultimate decommissioning of
18 a plant. And 60 years out or 40 years out, that is
19 something where there has got to be some vision on how
20 you are going to apply -- and I completely understand,
21 you've got in the plant, and this system is leaking
22 and you need to control it and all of that, but that
23 is kind of an inside-the-plant ALARA sort of approach.

24 Then the second part is what happens to prevent long-
25 term and perhaps very low-level radioactive material

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 contamination in and around the plant. I can
2 certainly understand a lot of that is the COL phase,
3 but you mentioned an example of how your double-walled
4 pipes will be monitored for leak protection or leak
5 currents. That is certainly one good thing. Are
6 there any other design features where you try to
7 address the ultimate decommissioning aspects?

8 MR. PEREZ: Yes, we have a -- basically a
9 design directive document that gives the system
10 engineers the guidance. And I have a system engineer
11 here who I work with -- Craig is a system engineer who
12 I work with to apply the guidance that is basically
13 implementing Reg Guide 4.21 for 20.1406.

14 For example, the small diameter piping in
15 walls that are later on are difficult to detect are
16 having the same pipes sloped do you don't have
17 sedimentation. We've looked at the -- this is from a
18 decommissioning perspective. Having all these tanks
19 separately segregated so you don't spread the
20 contamination is another feature, because now you can
21 focus, this is the area that will have potentially
22 contaminated cubicles versus the other areas of Group
23 III waste.

24 So the aspects of segregation which I
25 touched upon in Chapter 12 in November are one of

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 those features. Let me see. What else have we put
2 into the design from a decommissioning perspective?
3 Segregation, the double-walled pipe, sloping pipe.
4 Anything else you can think of?

5 MEMBER RYAN: You were mentioning pipe
6 chases and so forth.

7 MR. PEREZ: Yes, pipe chases.

8 MEMBER RYAN: Maybe it's an unfair
9 question, because from the add-on to what you've said,
10 it really does become a very safe specific kind of
11 implementation.

12 MR. PEREZ: The second part of your
13 question is more -- it depends on your site. The
14 sampling wells, how many -- how long is that distance
15 from the environmental release to --

16 MEMBER RYAN: I guess it depends on the
17 geohydrologic environment you are in as to what you
18 do. So there's a big piece of it in that arena, so I
19 appreciate that. And you did, I will say, cover quite
20 a lot of the design detail in terms of inspection
21 during operations that will allow for proof that
22 things aren't leaking. So that was a pretty good
23 discussion last time.

24 MR. PEREZ: Right, and we've had quite a
25 lot of interactions with the staff which asked lots of

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 questions about this.

2 MEMBER RYAN: There will be a COL step to
3 this.

4 CHAIR POWERS: There are a lot of COL
5 steps.

6 MEMBER RYAN: Thank you.

7 MR. PEREZ: You're welcome.

8 So that concludes my presentation. I do
9 have some -- there is a question concerning the
10 reliability of the evaporator and what happens when
11 it's not available. How dry was the density of the
12 bottoms, hydrogen and oxygen concentrations in the
13 volume?

14 MR. SCHMIESING: Pedro, I do have that
15 value. I just needed to confirm that with the system
16 engineer.

17 MR. PEREZ: Okay, Craig Schmiesing.

18 MR. SCHMIESING: It's 4 percent by volume
19 for hydrogen and 2 percent by volume for oxygen and
20 it's kept at a concentration level of 2.05 to 1
21 hydrogen to oxygen, and it's kept below the
22 combustible limits.

23 MEMBER STETKAR: Those are design specs,
24 though, on --

25 MR. SCHMIESING: The recombiner.

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 MEMBER STETKAR: -- the recombiner.
2 Sanjoy, were you asking that?

3 MEMBER BANERJEE: No, not in the
4 recombiner. I was looking at where could be the
5 largest accumulations.

6 MEMBER STETKAR: For example, the VCT, or
7 for example when you are venting to shut down. That's
8 -- I don't know where.

9 On your hit list, Pedro, put -- ask not
10 only the reliability of the evaporator but also the
11 centrifuge.

12 MR. PEREZ: Yes.

13 MEMBER STETKAR: It's routing the gas.

14 MR. PEREZ: Did I miss something? I was
15 writing something down while you were talking.

16 MR. WIDMAYER: You are going to get back
17 to us I think on the routing of the waste management
18 systems' piping?

19 MR. PEREZ: Between the -- between the
20 buildings, yes.

21 MR. WIDMAYER: That's liquid.

22 MR. PEREZ: Yes.

23 MEMBER STETKAR: In gas, fail positions
24 on the valves, isolation valves, and the recombiner
25 inlet/outlet and the hydrogen oxygen supply.

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 MR. PEREZ: What I like is, these are all
2 for Craig.

3 (Laughter.)

4 MEMBER STETKAR: I notice him feverishly
5 taking notes over there.

6 (Laughter.)

7 MR. PEREZ: He wasn't before, but now --

8 MR. WIDMAYER: A transcript is available.

9 CHAIR POWERS: Any other comments for
10 this presentation?

11 MR. SALAS: I believe we will find you a
12 way of getting the correct information.

13 CHAIR POWERS: Or you could come back and
14 visit us.

15 Okay, any other comments?

16 MEMBER RYAN: None.

17 CHAIR POWERS: I will take a break until
18 quarter after.

19 MR. PEREZ: Okay, thank you.

20 (Whereupon, the above-entitled matter went
21 off the record at 9:50 a.m. and resumed at 10:13 a.m.)

22 U.S. EPR DC SER WITH OPEN ITEMS FOR CHAPTER 11,

23 RADIOACTIVE WASTE MANAGEMENT

24 CHAIR POWERS: Let's come back into
25 session. We will now have the staff's view on this

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 Chapter 11. I'm not sure who's handling this. Jason,
2 are you going to present it?

3 MR. JENNINGS: Getachew is now arriving,
4 but I'll go ahead and get us started nonetheless.

5 I'm Jason Jennings. I'm the project
6 manager for Chapter 11. We met previously for Chapter
7 12. Mr. Chairman, I have no college basketball
8 allegiances one way or the other. If I had to choose,
9 it would probably be Villanova, and as a fan of all
10 Philadelphia sports, except for my baseball team
11 recently, I'm used to disappointment. So.

12 (Laughter.)

13 CHAIR POWERS: On that down note --

14 MR. JENNINGS: Yes, so as I mentioned,
15 I'm the project manager for Chapter 11. To my right
16 is Jean-Claude Dehmel, who is the lead reviewer for
17 Section 11.2 through 11.5. Michelle Hart was our lead
18 reviewer for Section 11.1. Also supporting us is Josh
19 Wilson off to the side here from Balance of Plant
20 Branch for 11.2 through 11.4.

21 This is our overview of the list of RAIs,
22 the number of RAIs that were issued on this chapter
23 and the number of open items in total. You will
24 notice that there are no open items remaining on
25 Section 11.1, and 24 in total on Sections 11.2 through

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 11.5, with a total of 71 RAIs sent out at this point.

2 Before I forget, I will mention that the
3 last slide in the package is a list of acronyms that
4 are used throughout the presentation, in the event we
5 try to slip one pass you somewhere along the line
6 here.

7 The next several slides includes a list of
8 all the open items by section. I won't take the time
9 to read these to you, and Jean-Claude will cover these
10 in the course of his presentation. They are part of
11 the package.

12 So at this point, I will turn it over to
13 Michelle Hart, who will address Section 11.1, and then
14 Jean-Claude will take us through the rest of the
15 slides.

16 Michelle?

17 MS. HART: Hello, I'm Michelle Hart. I'm
18 from the Siting and Accident Consequences Branch. I
19 have a master's in nuclear engineering from The Ohio
20 State University, so I have nothing to say about
21 basketball.

22 CHAIR POWERS: If it were football, we'd
23 be in better shape.

24 MS. HART: Perhaps. As Jason had said
25 there are no open items in Section 11.1. The coolant

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 source terms followed the guidance that we have and
2 followed also the ANSI/ANS-18.1 1999 standard. They
3 used the PWR GALE code. It's all what we expected to
4 see.

5 The key SRP interfaces, of course, with
6 the rest of Chapter 11 for the radwaste systems, with
7 the shielding sections of the SRP and also with the
8 design basis accident analysis.

9 For 11.1 there are no COL information
10 items, so there is nothing for a COL Applicant to
11 necessarily to do, and there are no open items.

12 CHAIR POWERS: A question comes up,
13 somewhat philosophical in nature, and probably more
14 pertinent to this particular application, and that is,
15 the widely used ORIGEN code and the overall confidence
16 we have in ORIGEN; our European colleagues don't
17 always seem to have that confidence. And yet it is
18 used by everybody and his dog in this country. Where
19 do we stand on that?

20 MS. HART: We're fairly confident that
21 the ORIGEN code is up to date for the higher burnup
22 fuels, and for the types of fuels that we are talking
23 about in these types of plants. They are 17x17 fuel.

24 The fuel in these plants are a little bit longer --
25 two feet longer than the plants that are currently

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 operating in the United States, except South Texas
2 also has 14 foot fuel. So we feel we have good
3 experience with this. There is not a lot of
4 difference in the way the fuel is exercised in the
5 plant. Plus, this particular applicant did a
6 parametric study to try to bound the source term.

7 MEMBER SHACK: And that covers using the
8 older version of the code that they used?

9 MS. HART: That was one of my RAIs. I
10 had several RAIs on the use of the ORIGEN code,
11 whether they -- because ORIGEN 2.1 is not currently
12 supported anymore by Oak Ridge, and they've moved on
13 to the package that is with the SCALE code, as well, I
14 asked about the use of high burnup cross section
15 libraries and the applicant did use the higher burnup
16 cross section libraries and they did a parametric
17 study to determine whether, if they had used the more
18 recent version of SCALE, and at that time it was the
19 version that was with SCALE 5 -- SCALE 6 has since
20 come out -- if the source terms would have been
21 different or remarkably different, and they would not
22 have been. The source terms that they have were
23 actually bounding for what they would have gotten in
24 the current version of ORIGEN.

25 CHAIR POWERS: Okay, so we're in good

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 shape on the source term.

2 MS. HART: I think we're in good shape on
3 the source term.

4 CHAIR POWERS: Okay.

5 MS. HART: We'll discuss it some more,
6 I'm sure.

7 CHAIR POWERS: One of the things that a
8 little bit surprised me on some of their discharges,
9 they said, gee, the only isotopes that we have that
10 are significant, tritium which you kind of expect,
11 cobalt 60 you kind of expect, iron 65, you kind of
12 expect. No manganese isotopes and that kind of
13 surprised me a little bit. I made a note to myself to
14 go check their steels because manganese chemistry is
15 unknown to everyone and it seems to go where it damn
16 well pleases to go.

17 MS. HART: Right.

18 CHAIR POWERS: So I'm a little bit
19 surprised as you that they didn't show any manganese
20 isotopes in their discharge.

21 Okay.

22 MR. DEHMEL: Okay, my name is Jean-Claude
23 Dehmel. I'm a health physicist with the Construction
24 Health Physics Group, and I have a B.S. from Manhattan
25 College in health physics, and a Master's from NYU in

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 health physics and I've been certified since 1986.

2 CHAIR POWERS: And your basketball
3 allegiances?

4 MR. DEHMEL: It's kind of strange. You
5 see I was born and raised in France, so I was exposed
6 to the Harlem Globetrotters.

7 (Laughter.)

8 So this part of the presentation will
9 focus on the balance of the radioactive waste
10 management system covered in Section 11.2 to 11.5 of
11 the SER. So for the liquid waste management system,
12 the topics of interest that were looked at were, for
13 example, the completeness of the information
14 supporting the description, and performance
15 characteristics of evaporated centrifuge systems in
16 treating liquid waste.

17 Specific concern about the use of
18 chelating and anti-foaming agent and how such agent
19 might impact the performance and integrity of the
20 demineralizer ion exchange columns.

21 Information supporting the development of
22 radioactive liquid effluent source terms, assumption
23 and parameters used in calculating the liquid effluent
24 releases and off-site doses to members of the public
25 and population and a description of the elements of a

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 quality assurance plan addressing the design,
2 fabrication, procurement and installation of the
3 liquid waste management system.

4 CHAIR POWERS: Did you also look at the
5 issues of fire?

6 MR. DEHMEL: Fire?

7 CHAIR POWERS: Fire.

8 MR. DEHMEL: No, that's addressed -- in
9 the -- when we talk about Section 11.3 there is an
10 issue having to do with General Design Criteria for
11 that. But with respect to routine fires, no.

12 CHAIR POWERS: I was just thinking of
13 fire particularly in the charcoal retention beds.

14 MR. DEHMEL: This is addressed in Chapter
15 11.3, when we talk about the gaseous waste management
16 system. That would not be an issue in the liquid
17 waste management.

18 With respect to the next slide, we looked
19 at supporting assumptions and parameters used to
20 assess the impacts of a postulated failure of a
21 radwaste tank. Interfaces with other plant systems
22 and operational programs and look at COL information
23 item, in this case the commitment for the COL
24 Applicant to conduct a site-specific cost-benefit
25 analysis.

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 So in essence, the topics I went through
2 are kind of recurring themes for the other sections,
3 11.3, .4 and .5. I'm not addressing the Off-site Dose
4 Calculation Manual here because it is addressed in
5 Chapter 11.5.

6 MEMBER STETKAR: Jean-Claude, before you
7 get to the gaseous stuff, there was a statement in the
8 SER that left me a little bit confused. The topic --
9 let me just quote the statement to give you a frame of
10 reference here. This is for processing capacity,
11 basically. It says, however, for events occurring at
12 low frequency or producing effluents not compatible
13 with currently used processing equipment, temporary
14 processing equipment may be brought into the radwaste
15 building. Therefore, the liquid waste management
16 system can be unavailable for about three days and the
17 temporary equipment can process that expected influent
18 while meeting NRC regulations. This satisfies the
19 Standard Review Plan caution in which processing
20 equipment should be assumed to be unavailable for two
21 consecutive days per week. In view of the above, the
22 staff determined that the equipment sizing and
23 processing rates are adequate for a liquid waste
24 management system.

25 Does that approval implicitly account for

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 the fact that they are going to use portable
2 equipment, because I thought the design capacity is
3 just based on the capacities of the hard-piped
4 systems?

5 MR. DEHMEL: That's right. There is no -
6 - the design certification does not endorse at this
7 point any temporary skid-mounted processing equipment.

8 Because to start with, it describes an option in the
9 FSAR and there is no information describing what kind
10 of system would be connected to supplement the
11 existing permanently installed system.

12 MEMBER STETKAR: I was confused because
13 this statement, the -- your determination that they
14 have adequate processing capacity, seems to rely on
15 the fact that they are going to need to use portable
16 equipment or perhaps I am misreading the statement.

17 MR. DEHMEL: Yes, I think it may require
18 some editing on our part. But basically, no, it does
19 not imply that. It simply says, it recognizes that
20 the margin that specified in the SRP, two to three
21 days, is rather narrow.

22 MEMBER STETKAR: It is and this was
23 excerpted from that discussion. There is a larger
24 discussion in the SER.

25 MR. DEHMEL: Right, right. It recognizes

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 that it's a rather narrow margin and that, since we
2 cannot essentially at this point endorse in the DCD
3 and the SER, in essence, the nondescript skid-mounted
4 processing system, it only recognizes the fact that
5 there are provisions to augment the permanently
6 installed system with some skid-mounted system that
7 would be brought on-board specifically to address an
8 operational event that would perhaps generate certain
9 types of waste that may or may not be compatible with
10 the existing system as installed.

11 MEMBER STETKAR: But your determination
12 is just based on their stated hold-up tank volume --
13 waste generation rate, processing rate, with a margin
14 of two or three days' downtime.

15 MR. DEHMEL: That's right.

16 MEMBER STETKAR: I just wanted to make
17 sure I understood that.

18 MR. DEHMEL: I will revisit that
19 language.

20 MEMBER STETKAR: When I read it, I got a
21 bit -- it was a good discussion but when I finally
22 came down to the conclusion, I got a little bit
23 concluded.

24 MEMBER SHACK: Yes, you just need to move
25 that sentence to the end of the paragraph.

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 MEMBER STETKAR: I am not going to
2 wordsmith it. I thought I understood what you were
3 doing until I got to that one little paragraph there.

4 MR. DEHMEL: For the gaseous waste
5 management system, so for the gaseous waste
6 management, the major topics of interest targeted in
7 the review were, again, the completeness of
8 information describing the operational features and
9 performance characteristics of the gaseous waste
10 management, for example, the hold-up time for noble
11 gases in the charcoal delay beds. Completeness of
12 information supporting the development of the
13 radioactive effluent source terms, description of the
14 elements of a QA plan addressing the design,
15 fabrication, procurement and installation of a gaseous
16 waste management system.

17 CHAIR POWERS: And I take it we did not
18 look at fire here?

19 MR. DEHMEL: No.

20 CHAIR POWERS: Why don't we look at fire
21 in the charcoal beds or around the charcoal beds or
22 near them?

23 MR. DEHMEL: Well, there is a description
24 in the system that it naturally provides the means to
25 detect if there is a problem with charcoal beds. For

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 example motion detection or fire, there is a means to
2 actually suppress, to flush the charcoal bed but it's
3 a contained volume of charcoal with the recognition
4 that O2 and H2 are introduced ahead of that to control
5 and recombine the hydrogen and oxygen. We don't look
6 at actually combustion of the charcoal.

7 Josh? Balance of plant? Any comments on
8 that?

9 MR. WILSON: Yes, that is exactly what I
10 was going to say, suppression/detection. I don't know
11 why the SRP doesn't talk about that.

12 CHAIR POWERS: Well, I can imagine many
13 things. The most likely time for fire is exactly when
14 you are using this for hold-up; it's during shutdown
15 and start-up processes. If you had a fire near or
16 adjacent and got much heat transfer, they hold that
17 function is strongly determined by temperature. It
18 seems to me it is something -- it comes to mind before
19 earthquake comes to mind. Let's say that.

20 MR. DEHMEL: Yes, I hate to tell you
21 this, but there is, I believe, in Section 9.5, it is
22 supposed to address fire protection; is that right?

23 MR. TESFAYE: Yes.

24 CHAIR POWERS: It might be separated into
25 a separate --

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 MR. DEHMEL: And it is also to meet the
2 GDC Criteria 3. So that's all I can say at this point
3 beyond what I just described.

4 MR. TESFAYE: We will consider this in
5 Section 9.5, if it is not already considered.

6 CHAIR POWERS: Okay, follow up on that
7 and just tell me what your status is and what your
8 thinking is because it may be that the wall is seven
9 feet thick and it would take a fire of heroic
10 proportions to raise the temperature a tenth of a
11 degree, in which case it's not really a problem. I'm
12 not so concerned about fire in the graphite itself; I
13 presume that is possible, but it is a fire adjacent to
14 it that would cause me -- I mean, at least I would
15 look. There may not be any combustibles in that area.

16 On the other hand, there probably is a hydrogen tank
17 and a hydrogen line and things like that.

18 MR. DEHMEL: All right, and this slide
19 has to do with the -- so with respect to this slide,
20 we looked at the information parameter using
21 calculating effluent releases and off-site doses,
22 again, to members of the public and populations.
23 Supporting assumptions of parameter used to assess the
24 impact of postulated failure of the gaseous waste
25 management component. Again, this interfaces with

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 other plant systems in operational program. Again,
2 the COLA on Applicant responsibility to look at the
3 merits of the cost-benefit analysis presented in the
4 FSAR, and again, as before the ODCM, which is used to
5 control gaseous effluent releases in this case is
6 addressed in Chapter 11.5.

7 For the solid waste management system,
8 again, we looked to make sure that there was
9 sufficient information that fully described the major
10 components of the solid waste management system, the
11 listing of systems into text, tables and figures, the
12 internal and technical consistency. We looked at the
13 information supporting the estimated storage capacity
14 for Class B and C low-level waste in the radwaste
15 processing building. Those were the slide that Pedro
16 presented earlier: the drum store room and tubular
17 shaft storage room.

18 We also looked at, and requested expanded
19 descriptions of inventories of expected low-level
20 waste specifically to include to those described, the
21 amounts of spent charcoal media and spent HEPA filters
22 that may be generated yearly. And we also looked at
23 system design feature used to commit and support
24 compliance with the waste disposal acceptance criteria
25 of the disposal site as well as the waste form

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 characteristics of 61.56.

2 Again the same thing about theme about the
3 QA plan addressing the design fabrication,
4 procurement, installation of the solid waste
5 management components interface with other plant.
6 Just as an aside, the solid waste management system
7 does not release directly any byproduct waste, namely,
8 liquid or gaseous waste, to the environment. All of
9 those wastes are routed either to the liquid waste
10 management system or the gaseous waste management
11 system. So in essence, there is no direct release
12 mechanism from that system to the plant stack or
13 through the discharge pipe.

14 So as far as the COL information
15 requirement, this one is a process control program, we
16 should address the methods and program procedures to
17 process waste such that it can be shipped, it can be
18 packaged and prepared to meet the low-level waste
19 disposal facility requirement as well as those of 10
20 CFR 61.55 on the waste classification, Class A, B or C
21 and 61.56 on the waste form, and essentially having to
22 do in this case with stability of the waste and
23 excessive presence of moisture or water in waste.

24 So the FSAR adopts the NEI PCP Template
25 which is a generic process control program where the

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 Applicant would fill in site-specific information. So
2 there was a Safety Evaluation Report written
3 specifically for the NEI PCP Template. So the
4 adoption of the NEI PCP Template is acceptable to the
5 staff.

6 For the process and effluent radiation
7 monitoring and sampling system, the issues that we
8 looked at were completeness again or completeness of
9 such system descriptions and operational
10 characteristics of radiation monitoring equipment.
11 Basically all this information is supposed to be in
12 Chapter 11.5-1 of the FSAR that describes the systems,
13 the dynamic operational ranges, whether or not they
14 have sampling systems and whether or not they have
15 automatic control features. So that is where the
16 focus was on that part of the review.

17 We also look at description of equipment
18 and provision used to collect samples in processing
19 effluent streams. Also looked at the interface of
20 other plant systems. And again, just like the solid
21 waste management systems the process effluent
22 radiation monitoring system does not generate any
23 waste. Basically what it does is, a sample stream is
24 either returned to the discharge point or returned to
25 the appropriate liquid waste management system or

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 gaseous waste management system.

2 Again on the COL information item, the
3 FSAR endorses the NEI Template for 07-09A and it's the
4 same, essentially, situation as was described for the
5 PCP. It's a generic template where the COLA is
6 responsible for, in this particular case, for
7 providing site-specific information and plant-specific
8 information: the site-specific information having to
9 do with the information that is drawn from the
10 periodic line-use sensors, whether those receptors are
11 line-use information, any credit for specific dilution
12 for liquid effluents that are released in surface
13 water bodies.

14 So in conclusion, we have a number of open
15 items, and those are associated with a technical
16 clarification and information supporting design basis
17 and description of the treatment system and the
18 radiation monitoring system. Another major focus has
19 been with the effort in confirming the estimates of
20 liquid and gaseous effluent releases and associated
21 doses, on both the meeting of requirements on Part 20
22 and Part 50 Appendix I. And then we expect the
23 resolution of the open items to be based on
24 forthcoming RAI responses and the resolution of
25 confirmatory items will be completed pending receipt

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 and review of the next portion of the FSAR. And we
2 talked about the PCP and the ODCM cost-benefit
3 analysis as COL information items that are going to be
4 obviously addressed on an application by application
5 basis.

6 MEMBER STETKAR: I have one.

7 CHAIR POWERS: Is it your intention to
8 keep it to yourself?

9 MEMBER STETKAR: If you tell me to, I
10 will.

11 CHAIR POWERS: I would never tell you such
12 a thing.

13 MEMBER STETKAR: And I don't know, Jean-
14 Claude, if this is for you or for Getachew. There
15 were a couple of statements, both in the gaseous waste
16 area and the solid waste area, where, let me just
17 quote this so I can get the context right, and it's
18 discussing a response to RAI -- a specific RAI. The
19 quote says, the Applicant stated the gaseous waste
20 management system does not have the safety-significant
21 features that warrant inclusion in FSAR Tier 1. The
22 staff disagrees with the Applicant's response to this
23 SAR and formulation of FSAR Tier 1 screening criteria
24 in determining which systems are included as an FSAR
25 Tier 1 entry. And then it goes on to say that, while

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 this issue has not yet been resolved to the staff's
2 satisfaction, it goes on to say that, well, you are
3 basically postponing that discussion until Chapter 14
4 regarding ITAAC. And I guess my question is, what
5 areas of disagreement do you have with the Applicant
6 regarding the screening criteria for what's in the
7 Tier 1 information in the FSAR? What is the issue
8 here, because I didn't have a chance to go back and
9 look at the whole stream of RAIs and responses? Both
10 within the context of -- is it only limited to the
11 waste management systems or is it a more generic
12 issue?

13 MR. TEFAYE: It is a more generic issue.

14 MEMBER STETKAR: Okay. Because this is
15 the first I've heard of that.

16 MR. TEFAYE: There is an outstanding RAI
17 and I can get you the details this afternoon.

18 MEMBER STETKAR: Outstanding RAI from NRO
19 Chapter 1?

20 MR. TEFAYE: No, Chapter 14.

21 MEMBER STETKAR: Oh, Chapter 14. Okay.
22 Okay.

23 MR. DEHMEL: Specifically, in the context
24 of this one, it has to do with the screening criteria
25 that were identified in Chapter 14.3 of the FSAR. We

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 looked at it and I did not see a screening criteria
2 that said, well, for plant systems that are used to
3 control releases, either effluent releases or doses to
4 members of the public, those systems were not included
5 in Tier 1. Traditionally, if you look at a
6 hierarchy, well, you know, is it safety-related? So
7 the thought was, if your systems are essential to
8 comply with Part 20, even though it's a lower tier,
9 right, of safety, there should be something in Tier 1.

10 And the concern specifically for the liquid and
11 gaseous waste management system -- and starting with
12 the gaseous waste management system -- is the thought
13 that, as far as Tier 1, there should be some
14 information to describe and commits that the proper
15 types and amounts of charcoal that have been
16 introduced into the charcoal delay bed because
17 otherwise the system will complete -- essentially
18 truly complete, with the valves and the piping and
19 everything and all the radiation monitoring, but if
20 the charcoal was missing, that means the performance
21 goal or commitment that they have made in Chapter 11.3
22 with respect to source term and outside doses. So a
23 similar RAI was generated for the liquid waste
24 management system to make sure that the initial
25 loading of ion exchange presents in the demin system

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 where they are. And again, the focus is on the
2 initial loading because it's understood that after
3 that it's the Applicant's responsibility, the COL
4 holder's responsibility.

5 MEMBER STETKAR: But, Getachew, you said
6 it's a more generic issue in terms of the screening
7 criteria that they apply across all systems?

8 MR. TESFAYE: Yes.

9 MEMBER STETKAR: Okay. I guess we will
10 see that in Chapter 14.

11 MR. TESFAYE: Chapter 14.

12 MEMBER STETKAR: I just wanted to make
13 sure that I understood whether it was a more generic
14 issue or whether it was only specific to these
15 particular topics. Obviously, it will filter down to
16 this but if it's generic, it will filter to several
17 other areas as well. Thank you.

18 CHAIR POWERS: Any other comments to make
19 on this?

20 Okay, I have checked with my designated
21 federal official and he tells me that I can go ahead
22 with the next chapter. But I can take a break and
23 allow people to get ready to make their presentations.

24 MR. TESFAYE: That may be a problem. I
25 don't think AREVA is here.

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 MR. WIDMAYER: He said he's all right.

2 MR. TEFAYE: All right.

3 CHAIR POWERS: Okay, we will have to do
4 half and then the other half will be after lunch.

5 MR. TEFAYE: Okay.

6 CHAIR POWERS: But that will move -- your
7 presentation will obviously move up this afternoon.
8 That's no problem for you?

9 MR. TEFAYE: No.

10 CHAIR POWERS: And we are sending you off
11 with a homework assignment.

12 MR. TEFAYE: Yes.

13 CHAIR POWERS: OK. Pedro is starting a
14 trend here that is getting infectious.

15 Okay, so we are going to take a break
16 until eleven o'clock and then we are going to come
17 back and start on technical specifications.

18 (Whereupon, the above-entitled matter went
19 off the record at 10:42 a.m. and resumed at 10:58
20 a.m.)

21 US EPR DC APPLICATION FSAR CHAPTER 16

22 TECHNICAL SPECIFICATIONS

23 CHAIR POWERS: I think we are in good
24 shape to get started. Thank you, Pedro, for allowing
25 us to move forward. And like I say, our schedule

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 calls for two hours. I'd like a break at noon or
2 wherever it's logical to break. I mean, you know, mas
3 o menos and advance forward. So, your show.

4 MR. SALAS: Robert Sharpe will be our
5 presenter. And Robert, do you want to -- this is your
6 first presentation.

7 MR. SHARPE: First presentation in about
8 25 years.

9 CHAIR POWERS: Well, we have a bit of a
10 tradition. The first time you speak in front of us,
11 you have to tell us why you are qualified to speak in
12 front of this August body. And today you have to tell
13 us your basketball allegiances.

14 MR. SHARPE: I prepared for that. My
15 name is Robert Sharpe. I'm with AREVA. I went to
16 school at NC State University, so that should give you
17 some idea. And my school was one of the few losses
18 that Duke had this year. I think there is a case to
19 be made that NC State should be the national champion
20 for that reason.

21 (Laughter.)

22 After graduating from NC State, I spent 31
23 years working for Duke Power, starting out at Oconee
24 and start-up testing and operator training and getting
25 my SRO license at Oconee. Moved from there to be the

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 licensing lead for both the Catawba units, and then
2 onto McGuire to be the regulatory compliance manager
3 for a number of years for moving and steam generator
4 replacements for Duke and then for Framatome and then
5 for AREVA, steam generator replacement support to the
6 new plant project and supporting EPR licensing.

7 CHAIR POWERS: So he's trying to put you
8 out of business, Shack.

9 MR. SALAS: I remember interviewing with
10 him when I got out of college.

11 CHAIR POWERS: You must have done pretty
12 well.

13 MR. SHARPE: I will discuss with you
14 today the development of the technical specifications,
15 the generic technical specifications for the U.S. EPR.

16 In developing the tech specs, we took the
17 U.S. EPR systems and compared them to the 10 CFR 50.36
18 criteria. The next slide will show that graphically
19 but I'll go through the words first. We found in most
20 cases that the Westinghouse Standard Tech Specs,
21 NUREG-1431 Revision 3.1, was the best fit. That was
22 not really a surprise because the U.S. EPR is a four-
23 loop active PWR, so many of the specifications fit
24 very nicely.

25 We did find that other standard technical

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 specifications were useful. We used the B&W standard
2 tech spec for the accumulator out of service time. We
3 used the Combustion Engineering Standard Technical
4 Specifications: the digital version for reactivity
5 control and power distribution limits along with
6 Westinghouse Tech Specs there.

7 We found in one case that the BWR-6 tech
8 specs, that surprised everybody --

9 CHAIR POWERS: That probably sticks in
10 your throat someplace. You probably had to look up
11 the acronym.

12 MR. SHARPE: Given my background, I know
13 very little about BWRs other than the control rods go
14 in the wrong way. But they did have a standby liquid
15 control system spec that was a good fit for the EPR's
16 extra borating system and so we used that as a
17 starting model.

18 And we also used AP1000 tech specs as a
19 precedent in a number of cases where there were up-to-
20 date features that plants now incorporate such as an
21 in-containment refueling water storage tank.

22 We did not develop risk-based tech specs
23 for the U.S. EPR and we accepted the completion times
24 and frequencies that are common in the Standard Tech
25 Specs.

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 This shows graphically what I just talked
2 about. The column on the left is just representative
3 of all the U.S. EPR systems and it continues on down
4 the alphabet and that's not in the list of acronyms,
5 trying to define all those.

6 That's all safety, non-safety. It is
7 everything -- applied the 50.36 criteria and that is
8 where we ended up using, of course, a number of NUREG-
9 1431 specs as a starting point. And I might add that
10 in some cases it really doesn't matter which spec you
11 are using. They are all the same, like the spent fuel
12 pool water level spec is the same in every PWR, even
13 though we saw we're using NUREG-1431, it would have
14 been the same if we were using CE or B&W.

15 Though the U.S. EPR Tech Specs continue to
16 be a complete document for use by COL Applicants,
17 there are some things that a COL Applicant would have
18 to provide. In Section 3.3.1 a COL Applicant would
19 need to confirm the setpoints that have been provided
20 for user setpoint control program for the protection
21 system setpoints.

22 In Section 4.1 there is a paragraph in
23 everybody's tech specs that describes the plant
24 location and in Section 5.6.2 there is an option of
25 single- or multiple-unit radiological reports.

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 In the ultimate heat sink makeup, a COL
2 Applicant would need to describe their unique makeup
3 for ultimate heat sink.

4 These are the chapter topics for the U.S.
5 EPR generic tech specs. This table of contents, if
6 you compared it with an operating PWR, would look
7 identical to it, but we really haven't changed a lot
8 from operating PWR tech specs.

9 A brief word on the treatment of trains.
10 The U.S. EPR uses four trains for the main safety
11 systems with an N+2 safety concept which allows for
12 one train to be out of service for maintenance or
13 surveillance; one train is assumed lost to a single
14 failure; one train may be lost to an initiating event
15 such as ECCS being lost to a pipe break in the wrong
16 location, and then that always leaves at least 100
17 percent capacity available for accident mitigation.

18 TSTF Travelers, the standard tech specs
19 are living documents. The NRC and the industry work
20 together to improve the tech specs. The Tech Spec
21 Task Force, which is an industry group, generates
22 proposed changes to the NUREG Standard Tech Specs, and
23 the NRC staff reviews and approves or disapproves
24 those changes. And then they are incorporated into
25 the standard and that's what we started with, the

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 Revision 3.1, and eventually a number of the tech spec
2 travelers, as they are called, will be being rolled up
3 into Revision 4.0.

4 So we took the TSTF Travelers that had
5 been improved since Revision 3.1 and reviewed each one
6 of those for applicability to the U.S. EPR. A number
7 of them we discarded because they were BWR-specific or
8 they were risk-based and the ones that were applicable
9 to the U.S. EPR we included those in our tech specs.

10 The differences between our tech specs and
11 the standard tech specs section by section now. In
12 general, we have revised the standard tech specs or
13 used tech specs as a model and incorporated the EPR-
14 specific design in our supporting safety analysis into
15 the specs.

16 In Section 1.1, with the definitions, we
17 revised definitions to reflect AREVA terminology and
18 core parameters. I think that is typically done in
19 everybody's tech specs.

20 In Section 2.0, a similar thing that we
21 revised to reflect that our fuel usage and our
22 methodologies that we use for fuel performance.

23 Section 3.1 and 3.2, as I previously
24 mentioned, we did use a combination of Westinghouse
25 and CE standard tech specs as best-fits for the

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 approach that AREVA takes to core management. For the
2 part-length control rods, because EPRs do not use
3 part-length control rods, and we revised it to our
4 nomenclature and fuel design in general.

5 Section 3.3, instrumentation, the digital
6 protection system that U.S. EPR uses incorporates
7 multiple functions that in standard tech specs would
8 be a number of the subsections in the tech specs. So
9 our protection system eliminates the need for some of
10 those separate sections such as engineered safety
11 features and diesel generator starting. We chose to
12 use a component- rather than a function-based approach
13 as most appropriate to the architecture for our
14 protection system.

15 In Section 3.3, Remote Shutdown Station,
16 we used the AP1000 precedent to reflect computerized
17 work station versus hard-wired Remote Shutdown Station
18 that most people are familiar with in operating
19 plants.

20 In Section 3.4, the Reactor Coolant
21 System, we revised the standard specs to allow for
22 limited 3-loop operation consistent with our safety
23 analysis. We did not incorporate a PORV specification
24 because U.S. EPR uses a pressurizer safety relief
25 valve, which I believe you have seen in previous

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 presentations. We also did not include loop isolation
2 valves or start-up of isolated loops because we don't
3 use those features.

4 And we did not incorporate a restriction
5 on high-head pumps for low-temperature overpressure
6 protection operation, because this is not a limiting
7 event for an EPR.

8 Section 3.5, emergency core cooling
9 systems, we needed to make a number of changes to
10 reflect the U.S. EPR design, first of which was to
11 incorporate an in-containment refueling water storage
12 tank. We also added the extra borating system. As I
13 mentioned the use of the BWR-6 tech specs that the BWR
14 tech specs just didn't have a two-train high
15 concentration boric acid system that fit.

16 We also added the IRWST and ECCS
17 specifications in Modes 5 and 6 to provide a core-
18 cooling capability during the reduced inventory
19 operation.

20 And we revised a number of tech specs to
21 reflect the use of enriched boric acid. We use
22 greater than 37 percent enriched boric acid in the
23 borated systems.

24 And we did not incorporate a seal
25 injection flow specification. Since CVCS is not a

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 safety system, it's not credited.

2 MEMBER STETKAR: Bob, on emergency
3 boration, I notice -- could you explain the rationale
4 that the tech specs are listed says that if the
5 concentration in the emergency boration storage tanks
6 is out of spec, you have 72 hours to restore it to
7 normal. But if an emergency boration train is in
8 operable, you have a seven-day allowed average time.
9 That doesn't seem consistent with the overall general
10 philosophy from all of the other systems in the plant,
11 where now you are down to a single operable train and
12 if that train fails, you fail that function.

13 So I was curious why the seven-day allowed
14 average time applies to a single train of emergency
15 boration rather than for example 72 hours, which would
16 seem more consistent with the overall philosophy?

17 MR. SHARPE: In general, we took the
18 allowed outage times from similar specs. In the case
19 of the extra borating system, it is a manually started
20 system. It is not automatically actuated.

21 MEMBER STETKAR: That still doesn't
22 really answer my question about the philosophy in
23 terms of n minus x whether it is one, two, three or
24 four.

25 MR. BERGERON: On the seven days versus

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 the 72 days --

2 MEMBER STETKAR: Seventy-two hours. I
3 was trying to read through and figure out the basic
4 philosophy when you get down to x, and if you have
5 four Xs, too, because it is n minus two, once you get
6 down to two remaining, you fall into a 72-hour time.
7 So I'm trying to think now in a two-train system what
8 would be the analogous time window, and seven days
9 just --

10 MR. BERGERON: I understand your
11 question. I'm not sure where the seven days came
12 from.

13 MEMBER STETKAR: I can understand it came
14 from another plant design that might not necessarily
15 comply with this.

16 MR. SHARPE: I think we will have to get
17 back to you on that.

18 MEMBER STETKAR: Okay, thanks, I'd
19 appreciate that. Because it was the one area in the
20 whole safety system that sort of jumped out at me as
21 different. I look back at the bases, and the bases
22 don't describe why 7 versus 73 --

23 MR. SHARPE: Okay, thanks.

24 Section 3.6, the containment systems, U.S.
25 EPR does not incorporate containment spray in the

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 cooling systems that may be used to. We use other
2 means for removing heat from the containment and those
3 of course are reflected in the tech specs.

4 We also eliminated the bypass leakage
5 which in many operating plants is containment leakage
6 that does not terminate in an appropriate area. In
7 EPR all penetrations terminate in one filtered area or
8 another, so we have eliminated that bypass leakage
9 term.

10 Section 3.7, the Plant Systems, we revised
11 a number of these specifications to reflect the U.S.
12 EPR design. I believe you had a presentation already
13 on the main steam system, so you know that in Chapter
14 10 --

15 MEMBER STETKAR: I don't know if we've
16 had Chapter 10 yet.

17 MR. TESFAYE: Yes.

18 MEMBER STETKAR: I'm sorry. We are
19 intimately familiar with that --

20 (Laughter)

21 MR. SHARPE: From that you would have
22 learned that the valving arrangement on the steam
23 lines is a little bit different. We don't have the
24 large number of main steam safety line and main steam
25 relief trains is a part of that. So therefore the

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 specs needed to change for that reason.

2 Also the emergency feed roller system has
3 a motor driven pump in each train, and a turbine
4 driven pump, and has a separate water storage pool for
5 each of the four pump trains.

6 We also added safety to our water system
7 as a tech spec that is not in the standard.

8 We also added a specification in the main
9 steam line leakage since we take credit for leak
10 before break inside containment.

11 MEMBER STETKAR: Here too, in the
12 controlling air conditioning system, acronym CRACS,
13 with a C, the tech spec says with two control room air
14 conditioning systems, trains inoperable, to restore
15 one inoperable train to operable status in 30 days.
16 Here again I am down to N minus two and I have a 30-
17 day time limit for this system rather than what I
18 would have expected to see is 72 hours. And 30 days
19 is a long time.

20 MR. SHARPE: If you look at the standard
21 specs that follows the same thinking there -

22 MEMBER STETKAR: For a four train system?

23 MR. SHARPE: I just wrote down from the
24 first system out of service was 120 days, and got down
25 to some point that we looked at a current plant and

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 then applied the 72 hours.

2 MEMBER STETKAR: That's right, and that
3 is consistent with all of your systems like the
4 injection systems, electrical systems, except for this
5 one. It says 30 days once I - if I'm down to two out
6 of service rather than 72 hours.

7 MR. SHARPE: Again, I'll have to go back
8 and review that.

9 MEMBER STETKAR: I'd appreciate that,
10 because the - again, back in bases, I'd want to see if
11 the bases had any more elaboration. And they really
12 don't. This again seems to be a bit of an anomaly.

13 MR. SHARPE: Okay, we'll take a look.

14 Section 3.8, electrical power systems, the
15 electrical specs for U.S. EPR look very much like the
16 current operating fleet. They are pretty consistent
17 across BWRs and PWRs. The big difference being that
18 U.S. EPR does have four electrical trains with four
19 emergency diesel generators, and we've revised the
20 specs to reflect that.

21 Section 3.9, refueling operations, we did
22 not incorporated the unborated water source isolation
23 valve as allowed by the standard tech specs, since we
24 did boron dilution analysis in those sets.

25 MEMBER STETKAR: Okay, you have a boron

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 dilution analysis, and I went to go look at that
2 analysis in Chapter 15. And the analysis takes credit
3 for the protection system signals that isolates the
4 CVCS system. So why don't you have a tech spec that
5 requires operability of that isolation function
6 including the isolation valves?

7 MR. SHARPE: The valves are in a separate
8 spec.

9 MEMBER STETKAR: Where are they? I
10 couldn't find them.

11 MR. SHARPE: I can find them.

12 MEMBER STETKAR: Okay, if you could I'd
13 really appreciate it.

14 MR. SHARPE: Maybe after lunch. Those
15 are CVCS valves, and because CVCS is non-safety we
16 didn't have that CVCS spec. So we had to find another
17 place to put them.

18 MEMBER STETKAR: If you could point me to
19 where they are. I went looking for them and couldn't
20 find them. I don't really want to read every word in
21 the tech specs.

22 MR. SHARPE: We do have that one.

23 MEMBER STETKAR: Okay, thanks.

24 MR. SHARPE: We replaced the containment
25 penetration specification that is in Section 3.9 with

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 a specification for fuel decay time that is consistent
2 with Pedro's dose analysis.

3 In Section 5, administrative controls, we
4 really needed to make a number of changes to reflect
5 the U.S. EPR design, first of which was the use of
6 grouted tendons, which is not typical, so we had to
7 change that aspect to reflect the grouted tendons. We
8 revised the steam generator program per TSTF. That
9 spec is now pretty common among plants that have
10 replaced their steam generators and have Alloy 690
11 tubing.

12 We added a tech spec, another TSTF on
13 controlling habitability. And we replaced the liquid
14 outdoor storage tank discussion with a reviewer's note
15 since the U.S. EPR doesn't come standard with an
16 outdoor storage tank.

17 MR. WIDMAYER: Robert, excuse me, you
18 have to be careful with the microphone when you are
19 turning your pages.

20 (Off the record comments.)

21 MR. SHARPE: In summary we found
22 applicable instances of 50.36 regulation, including
23 the tech specs. We found the format, content and
24 usage rules for the Improved Standard Tech Specs. And
25 it reflected the design of the U.S. EPR in these tech

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 specs.

2 The last page is the acronyms.

3 (Off the record comments.)

4 CHAIR POWERS: Any other questions from
5 the committee on the technical specifications chapter?

6 Seeing none, I will recess until one
7 o'clock.

8 (Whereupon, the above-entitled matter went
9 off the record at 11:25 a.m. and resumed at 12:58
10 p.m.)

11 CHAIR POWERS: We will come back into
12 session. You wanted to say something?

13 MEMBER STETKAR: Yes, I have been given
14 the section of the tech specs that indeed does address
15 the isolation valves for the CVCS. So now I'm aware
16 of it and this seems reasonable. I was just looking
17 for it. Thank you.

18 CHAIR POWERS: Your record is now
19 complete?

20 MEMBER STETKAR: That's a stretch.

21 (Laughter.)

22 MEMBER STETKAR: I'm pretty happy about
23 these valves, though.

24 CHAIR POWERS: Well, you are easier to
25 please than most of us.

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 MEMBER STETKAR: I'm an engineer.

2 CHAIR POWERS: We will now continue with
3 our discussion of the technical specifications,
4 Chapter 16, with the staff presentation.

5 U.S. EPR DC APPLICATIONS FSAR CHAPTER 16, TECHNICAL
6 SPECIFICATIONS

7 MR. TESFAYE: Good afternoon. Again, my
8 name is Getachew Tesfaye, I'm the project manager for
9 EPR design certification.

10 We are here to present Chapter 16, the SE
11 with Open Items. Pete Hearn will be leading that
12 discussion. Before we get started I took an
13 assignment this morning from you, so this is not on
14 Chapter 16; this is Chapter 11.

15 I talked to the Chapter 9 guy. He
16 informed me that Section 9a includes the area where
17 these charcoal beds are.

18 CHAIR POWERS: Okay.

19 MR. TESFAYE: Which is the auxiliary
20 building and the fire analysis is done in Section 9a.

21 CHAIR POWERS: 9a.

22 MR. TESFAYE: And I also talked to Jean-
23 Claude Dehmel. He's going to put a pointer in his SE
24 to indicate where that fire analysis is done.

25 CHAIR POWERS: Very nice. Thank you very

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 much.

2 MR. TESFAYE: You are welcome.

3 CHAIR POWERS: Okay, Peter.

4 MR. HEARN: My name is Peter Hearn. Do
5 you want my background?

6 CHAIR POWERS: You bet.

7 MR. HEARN: After graduating Brooklyn
8 Polytechnic Institute, which is now the Polytechnic
9 Institute of NYU, I went to work for the Navy for
10 about five years where I worked in the ship propulsion
11 systems on diesel-powered, steam-powered, gas turbine-
12 powered, and the secondary side of the nuclear-powered
13 systems.

14 Then I came to the NRC in '73 -- or the
15 AEC. And at the AEC, I spent over 10 years in the
16 auxiliary systems branch, which included the balance
17 of plant, chemical engineering, and the diesel
18 generators.

19 Spent over 10 years in the containment
20 systems branch. Spent about 15 years in the technical
21 specifications. Now I'm in projects. And that brings
22 us up to the presentation. We'll start with the
23 technical reviews. They are all from the Technical
24 Specifications Branch. There's Hien Le, Joe
25 DeMarshall, and Derek Scully.

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 Hien and Joseph will be doing the
2 presentations on the tech specs.

3 The next slide is the overview of the
4 areas where the review took place. The first column
5 is the Chapter 16 section. The second column is the
6 title of the section. And then the third column is
7 the number of RAIs, questions asked, and the last
8 column is the number of open items. And you can see
9 the distribution by the subject matter. A lot of
10 questions in the electrical and instrumentation areas.

11 All told, we had 293 questions, with 30
12 open items. The next slide is a listing of all 30
13 open items with a brief description of what they
14 entail. We use this as a check-off list when we close
15 out open items.

16 MR. TESFAYE: I would like to say
17 something about this discussion here. In all the
18 chapters that we have presented, we are listing all
19 the open items so that when we come back in Phase 5,
20 we know exactly where we left off. So this is just
21 for the record.

22 CHAIR POWERS: That's right. I think we
23 understand that and if there were any of them that you
24 thought were particularly significant, you would have
25 highlighted them.

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 MR. TESFAYE: Yes.

2 MR. HEARN: After the listing of the open
3 items, that will bring us to the overview of the
4 technical presentation which will be presented by Hien
5 Le.

6 MR. LE: My name is Hien Le. I am with
7 the Technical Specification Branch. I'm a technical
8 reviewer for mechanical system area.

9 In our presentation today, we will go
10 through applicable regulations and review guidance,
11 our tech spec review criteria that we use --

12 MR. TESFAYE: Hien Le, could you please
13 give a little bit of background information about you.

14 MR. LE: My background is; I finished my
15 bachelor from Long Beach State University in
16 California and finished my MS from UCLA in mechanical
17 engineering. And then after that, I start working
18 with Bechtel Corporation doing start-up for San Onofre
19 nuclear plant Units 2 and 3 at the time they tried to
20 complete their start-up program there.

21 When Bechtel conclude their program there,
22 I left Bechtel and working for various start-up
23 programs around the country at the time. I'm doing
24 some technical review for a start-up program in
25 Clinton for two years there, and then I move to South

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 Texas to review the record at the time and also start-
2 up program for South Texas. After staying in South
3 Texas for three years, I came to Calvert Cliffs
4 nuclear plant. At the time Calvert Cliffs nuclear
5 plant was in the watch list, so I come in, working
6 there for two years as a contract helping to include
7 vendor from technical manuals, upgrade that program
8 there. And then became permanent worker, permanent
9 for Calvert Cliff from 91 to 2005, after 14 years.

10 I left Calvert Cliff. I joined NRC and
11 now I work in the NRC for four years, slightly more
12 than four years.

13 Starting now with QA group vendor
14 inspection group in the NRR, and two years ago,
15 joining the NRO tech spec branch, and been with this
16 branch since.

17 MEMBER RAY: Thank you for your service
18 at San Onofre. I was the project manager there.

19 MR. LE: Bechtel or --

20 MEMBER RAY: Edison.

21 MR. LE: Edison.

22 CHAIR POWERS: San Onofre 2 was the first
23 commercial nuclear plant I ever toured, just prior to
24 it going critical.

25 MR. LE: If you recall John Hirsch, he

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 was my boss at the start-up organization for Edison.

2 MEMBER RAY: That was a lot of fun we had
3 there.

4 MR. LE: I am starting now with the
5 applicable regulation. Okay, we going through
6 applicable regulations and review criteria, then our
7 review criteria in the tech spec area. I think --
8 going fast through the summary, RAI summary. After
9 that we will go into significant issues, open issues
10 that we identified. For the regulation and review
11 criteria, we have 10 CFR 50.36 and 10 CFR 50.36(a).
12 50.36 provides requirements for content in tech spec
13 that -- in an operating license. The 50.36(a) require
14 tech specification for control of effluent,
15 radioactive effluent, from the operating plant to the
16 environment.

17 I want to make a note here that that
18 Generic Letter 89-01 allowed the relocation of all of
19 those requirements from tech specs, and implement the
20 programmatic control in the tech spec, administrative
21 control in tech spec Section 5, so with the current
22 tech spec, we would not see any tech spec for the
23 control effluent from open plant.

24 Then CFR 52.47(a)(11) require that a DC,
25 design certification application include tech spec in

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 accordance with the requirement at 50.36.

2 The guidance was provided in SRP Chapter
3 16. Basically, SRP Chapter 16 recommend use of
4 standard tech spec for guidance relating to the format
5 and reliable content for the information provided in
6 the base.

7 NRC issue five sets of SDS for three BWR
8 design and two BWR design. The three BWR designs from
9 Westinghouse, Combustion Engineering and Babcock and
10 Wilcox. For the two designs for BWR is from GE.

11 So based on those regulations and
12 guidance, the staff review of the proposed GTS and the
13 base, we ensure that the specification meets the
14 requirement of 10 CFR 50.36 regarding safety limits,
15 limiting safety system setting, limiting the condition
16 of operation, surveillance requirement, design feature
17 and administrative control. That is the content of
18 tech spec.

19 We will ensure that they will conform to
20 the STS format, the STS convention regarding format
21 and usage rule and level of detail for information
22 provided in the base, and ensure that tech spec
23 requirement and the information in the base reflect
24 EPR design and accident analysis provide in the FSAR.

25 This is just a capture of what Getachew

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 mentioned earlier, a total of 293 RAI issues, with the
2 30 open items. The 15 confirmatory items is for a
3 proposed change. That was reviewed and found
4 acceptable by the NRC but we need to verify that the
5 proposed change will be incorporated correctly in the
6 future revision of the DCD.

7 Of the 30 issues, open items, we found
8 five issues that we feel are significant enough that
9 would be of interest to the Subcommittee members. The
10 first one was on 120 days' completion time to restore
11 a train to an operable status for condition with one
12 out of four required trains inoperable due to
13 maintenance.

14 The second issue is on surveillance
15 testing of instrumentation systems. The third issue
16 is on specification requirement on the post-accident
17 monitoring instrumentation system before was on
18 specification on remote shutdown system. And the last
19 one is the omission of the manual reactor trip
20 function from the EPR GTS.

21 For this 120-day completion time, EPR
22 proposed this particular completion time in LCO for
23 six safety-related systems that have four independent
24 trains. Those six systems are safety injection
25 system, emergency feedwater, component cooling water,

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 essential service water, the ultimate heat sink and
2 the emergency diesel generator system.

3 I want to point out here that the EDG
4 system is a support system to the other five systems.

5 This is an item that we will cover later.

6 For those - for the six systems, except
7 for the emergency diesel generator, the remaining
8 three inoperable trains in order, five system by
9 design still satisfy the single-failure criteria
10 without further system equipment realignment.

11 For the EDG system, in contrast,
12 additional alignment is required to maintain that
13 capability. We will cover the EDG system requirements
14 in later slides.

15 Under the SDS guidance, unlimited
16 operation is allowed when an alternate configuration
17 can withstand a single failure in a design basis
18 accident. What I mean by unlimited operation in the
19 language of SDS, it was a continual operation for an
20 unlimited period of time after you implement the
21 alternate configuration.

22 Therefore, from a deterministic point of
23 view, any proposed condition time for those five
24 systems is acceptable to the staff. However, because
25 the EDG system is a support system to the other five,

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 the staff final disposition of this 120-day completion
2 time is dependent upon resolution of the staff concern
3 in the EDG system.

4 MEMBER STETKAR: Could you explain that
5 rationale just a little bit? Why, by definition, are
6 the EDGs more important than the other systems?

7 MR. LE: The EDG system was a support
8 system.

9 MEMBER STETKAR: As is component cooling
10 water or essential service water.

11 MR. LE: Yes, every other system was a
12 supported system. So this one was when you had -- you
13 don't want to have the completion time on the
14 supported system is less or more restrictive than the
15 support system.

16 MEMBER STETKAR: Why doesn't that same
17 rationale apply, though, to the emergency service
18 water system which is a support system for all heat
19 removal for design basis accidents, and in fact, if an
20 emergency service water pump fails, I do not have that
21 system, whereas if an EDG fails, I still have offsite
22 electric power? I don't understand the rationale for
23 focusing only on EDGs as the most important support
24 system. That's basically what I'm trying to ask you.

25 MR. LE: In this particular case because

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 we don't have a precedent, we still meet the
2 redundancy requirement in this particular case, 120-
3 days completion time. So my argument is on
4 application of this 120 days, why --

5 MEMBER STETKAR: I see that rationale but
6 me flip it on you. If you fully accept the rationale
7 of 120 days for emergency service water; is that
8 correct?

9 MR. LE: We accept the 120 days in this
10 case if the EDG accept the 120 days before -- 120 days
11 after realignment.

12 MEMBER STETKAR: Let's not talk about
13 EDGs. Let's talk only about emergency service water.
14 Do you accept the 120 days for emergency service
15 water because as I understood it you said there were
16 six safety related systems? You elaborated what those
17 six were, and you are now focusing on EDGs as being a
18 special case. So that tells me that the emergency
19 service water is not a special case.

20 MR. LE: I can directly answer your
21 question, yes, we can accept a 120 day for the
22 essential service water with one train out, of the
23 four train, because with the three remaining trains we
24 still fully support the safety --

25 MEMBER STETKAR: Doesn't that same

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 rationale apply, then, to the EDGs? Doesn't that
2 same rationale then apply to the emergency diesel
3 generators?

4 MR. LE: The emergency diesel generator,
5 okay, remember, we don't have -- we don't need any
6 realignment for the service water.

7 MEMBER STETKAR: Okay.

8 MR. LE: We don't need anything. If we
9 have one out, that one out is not -- we still maintain
10 fully redundancy. I mean we still fulfill the single
11 criterion, and our requirement of the accident
12 resistance has been met. So with one service water
13 train out, that's true, we don't need anything.

14 MEMBER STETKAR: So your primary concern,
15 if I understand it, and maybe you will get to it in a
16 later slide, with the EDGs is not the EDG itself in a
17 sense; it's the necessity to realign that system to
18 pick up the -- the other two systems.

19 (Simultaneous speaking.)

20 MEMBER STETKAR: Okay, that helps a
21 little bit to kind of straighten out what the real
22 concern is. And the -- just to make sure I've got it,
23 the basis for your acceptance of the other ones is
24 that -- I think the last bullet on this slide covers
25 that -- is that basically the standard tech specs

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 would allow essentially an infinite allowed average
2 time for those so therefore 120 days is fine.

3 MR. LE: Yes.

4 MEMBER STETKAR: Okay, thank you.

5 MR. LE: At this point, I would like to
6 turn over our presentation to Joe DeMarshall for his
7 discussion on EDG and instrumentation systems.

8 MR. DeMARSHALL: Good afternoon. My name
9 is Joe DeMarshall. I'm the technical reviewer for the
10 instrumentation and electrical tech spec sections of
11 the design cert.

12 Prior to joining the NRC, I spent six
13 years in the naval nuclear power program, submarines.

14 I qualified as a Reactor Operator and Engineering
15 Watch Supervisor.

16 Prior to joining the NRC in March of 08, I
17 spent 18 years with PSE&G, all 18 years at the Hope
18 Creek Nuclear Generating Station, six of which were
19 spent as an I&C systems engineer, and the last eight
20 were spent as a licensed ownership Senior Reactor
21 Operator.

22 Bachelor of science degree in industrial
23 engineering technology from the University of Southern
24 Maine.

25 Okay, I'm ready to move into the slides.

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 The 120-day completion time for one diesel inoperable.

2 The alternate feed design feature serves as the basis
3 for the 120-day completion time in LCO 3, with AC
4 sources operating. Let me take a few minutes just to
5 talk about the alternate design feature. Basically,
6 the EPR emergency power supply system consists of four
7 divisions. There are four Class 1E buses. And within
8 in the EPR emergency power supply system, the system
9 utilizes a divisional paired concept in which
10 divisions one and two constitute one divisional pair,
11 divisions three and four make up a second divisional
12 pair.

13 It's important to note that between those
14 divisional pairs they are completely independent.

15 Alternate power feed capabilities within
16 each divisional pair provide a standby source of power
17 to require safety-related equipment within a division
18 when the associated diesel is inoperable. So for
19 example, if division one diesel is out of service for
20 maintenance, a standby source of AC power can be
21 supplied from division two with an alternate feed
22 alignment and the same thing, division one can supply
23 division two if the division two diesel was out of
24 service. Same capabilities exist within the second
25 divisional pair, for divisions three and four.

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 At no time is the alternate feed alignment
2 configured between divisional pairs. It is strictly
3 within the defined divisional pairs.

4 The alternate feed alignment is not a
5 temporary modification. It is an actual design
6 feature. However, it is not the normal configuration
7 and it is implemented only when in a tech spec
8 accident state that is intended to be temporary in
9 nature.

10 The U.S. EPR safety analysis assumptions
11 in Chapter 15 of FSAR satisfy the three operable
12 diesels in the alternate feed established. With one
13 diesel inoperable and alternate feed-aligned, there is
14 sufficient AC power source availability to ensure the
15 completion of all safety functions for a postulated
16 accident coincident with a single failure and the loss
17 of offsite power.

18 In order to conclude that the 120 day
19 completion time is acceptable the staff needs
20 assurance that use of the alternate feed design
21 feature to support maintenance activities rendering a
22 diesel inoperable will be infrequent. And what I mean
23 by that is, the staff's main concern is that remaining
24 in a nonstandard alignment and alternate feed
25 configuration for an extended length of time, up to

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 120 days should not be viewed as routine because of
2 the potential for an additional failure or failures
3 that could result in additional challenges to plant
4 operators, such as the complication of actions
5 necessary for operators to stabilize or recover the
6 plant.

7 With that concern in mind, the staff
8 requests that AREVA provide the following information
9 in a followup RAI: a detailed list of maintenance
10 activities that would result in a diesel being out of
11 service for a period of up to 120 days; the
12 approximate maintenance time associated with each
13 activity; the frequency of these maintenance
14 activities; and the type of compensatory measures that
15 would be in effect during the 120 days and what
16 configuration control management would be in place for
17 an additional diesel failure.

18 The RAI response is pending.

19 MEMBER STETKAR: Joe?

20 MR. DeMARSHALL: Yes.

21 MEMBER STETKAR: I really like those
22 questions by the way.

23 On the other hand, if I take a very
24 cynical view of life, if they are allowed to have a
25 diesel inoperable for 120 days for any reason,

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 regardless of what they may say in an RAI response are
2 the most likely causes for entering this 120 day
3 condition. If I'm operating in the plant and
4 something happens to my diesel and I can't get spare
5 parts for 119.5 days, I'm still okay. So in terms of
6 the frequency of entering this LCO it's interesting
7 information but it's not clear what type of regulatory
8 basis it has, is it?

9 MR. DeMARSHALL: Correct. Because with
10 three diesels operable, and with the cross-feed
11 established, single failure criteria is met.

12 MEMBER STETKAR: So in truth the
13 frequency at which they enter that condition, as long
14 as the protection is in place to ensure that they have
15 the cross feed aligned is not a completely moot point,
16 but in a sense it's an excellent point.

17 MR. DeMARSHALL: Right, the staff's major
18 concern is that -- when I use the word infrequent, I
19 mean not routine. And what I'd like at this time, I'd
20 like Peter Kang from the electrical branch, if you
21 could elaborate on that, because that is your staff's
22 major concern.

23 MR. KANG: Hi, my name is Peter Kang.

24 The way the EPR is designed, they are not
25 totally independent four divisions, right. It's

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 functionally independent.

2 MEMBER STETKAR: I understand the design.

3 My only point is that I think it's interesting that
4 you are asking the applicant for information about how
5 frequently they think they will enter this 120-day
6 LCO, but indeed, whatever information is available
7 right now at the design stage is not binding on the
8 final licensee, the people who actually operate this
9 plant and indeed, if they are allowed 120 days -- he
10 can take up to 120 days for any reason. If they want
11 to paint the room, they can go out and paint the room
12 for 120 days because they are still following the
13 regulation.

14 MR. KANG: Before they go into a 120-day
15 LCO, they have to perform the usual analysis as
16 compensatory maintenance, and also -- but in this
17 case, this feature is a design feature as a part of
18 design, and could be very useful during online
19 maintenance. But on the other hand, the negative side
20 is, they could start operating at all times with only
21 three diesels. We are concerned that we can't prevent
22 it. So this is the negative side of it.

23 MEMBER STETKAR: But my point is, is,
24 indeed, from a design basis safety perspective,
25 indeed, if they can operate continuously with only

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 three diesels in the plant, provided that they have
2 assurance that those three diesels are operable and
3 that the alternate feed connection is established and
4 available, there is nothing to argue against that.

5 MR. KANG: Yes, other than the fact that
6 it's an off-normal configuration.

7 MEMBER STETKAR: It's an off-normal
8 configuration, but it does not actually impair the
9 design basis safety response of that plant.

10 MR. KANG: Yes.

11 MEMBER STETKAR: Okay. So that's my only
12 point in terms of asking about how frequently -- at
13 this stage in the design process, how frequently do
14 they anticipate entering that LCO, that's an
15 interesting piece of information, but indeed, if being
16 continuously in that LCO, which they can at a plant
17 level, they could have one diesel out continuously.
18 As long as that still satisfies the fundamental design
19 safety of the plant, then the frequency that they
20 enter that condition is not necessarily be prudent
21 operation but it's not something from a licensing
22 perspective. I just wanted to make sure I understand
23 that. I still like the question.

24 MR. DeMARSHALL: Okay, that includes my
25 topic of the 120-day completion time for one diesel

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 inoperable. Next slide, please.

2 I'd like to talk about instrumentation
3 surveillance requirements for the EPR protection
4 system. The U.S. EPR protection system, it's
5 important to understand that it is an integrated,
6 digital reactor protection system and engineered
7 safety features actuation system. For this reason,
8 EPR instrumentation tech specs combine the standard
9 tech spec LCOs for reactor trip system
10 instrumentation, and SFAS instrumentation in one LCO
11 for the protection system.

12 There are two significant open item issues
13 associated with surveillance requirements. The first
14 has to do with the fact that the protection system LCO
15 utilizes a component-based approach to surveillance
16 testing rather than the function-based approach that
17 has been the standard for nuclear power plants
18 currently operating in the United States.

19 Protection system surveillance
20 requirements are specified for individual components
21 instead of for the significant safety functions that
22 these components support, components such as sensors,
23 manual actuation switches, signal processors and
24 actuation devices.

25 Operating a plant in a standard tech spec

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 instrumentation LCOs for a rapid trip system and SFAS
2 instrumentation include a single table that specifies
3 significant safety functions required by technical
4 specifications along with the associated surveillance
5 requirements. So in that table, the surveillance
6 requirements are specified for the significant safety
7 functions.

8 EPR LCO 3.3.1, protection system LCO, has
9 two instrumentation tables. One is a dedicated table
10 that lists all of the components associated with the
11 significant safety functions. And a second table that
12 specifies only the significant safety functions and
13 the permissive signals.

14 Surveillance requirements are specified
15 only for -- only in the component table for the
16 individual components. Surveillance requirements are
17 not specified for the significant safety functions and
18 that is a deviation from standard technical
19 specifications.

20 The staff was unable to determine how
21 surveillance testing specified solely at the component
22 level ensures that each safety function required by
23 technical specifications is adequately tested,
24 including verification of the limited safety system
25 setting.

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 This determination proved to be
2 particularly challenging for the staff with respect to
3 the following two items: detection system logic for
4 certain functions requires upon the acquisition of
5 input signals from more than one sensor. Secondly, in
6 many cases the design relies upon a single sensing
7 device to provide the input signals for multiple
8 functions. It was not evident to the staff that the
9 performance of surveillance testing specified for each
10 of the components utilized in these ways provides
11 assurance that the functions supported by these
12 components are operable. That's the conclusion of my
13 first point.

14 The second significant open item issue
15 associated with surveillance requirements is that the
16 U.S. EPR digital protection system includes continuous
17 sub-monitoring online diagnostics to verify the proper
18 functioning of digital systems and to ensure the
19 integrity of the installed application system
20 software. The FSAR requires these features as a means
21 of ensuring partial compliance with established
22 surveillance requirements for reactor protection
23 systems, and also justifying the release of the
24 channel check and actuation logic test surveillances.

25 I'd like to note that continuous self-

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 testing with on-line diagnostic monitoring
2 capabilities are being evaluated in Chapter 7 of the
3 SER to determine the extent to which these features
4 may be credited for surveillance testing.

5 CHAIR POWERS: So your review does not
6 deal with the Chapter 7 function? You simply note
7 that that they are asking for credit for that.

8 MR. DeMARSHALL: That is correct. There
9 is a topical report that has been reviewed by Chapter
10 7 with respect to those issues.

11 MEMBER RAY: Dana, what is -- what is
12 your point there?

13 CHAIR POWERS: The point is that his
14 assessment does not constitute an acceptance that that
15 contention that the staff is making -- your previous
16 slide. You simply note that that is what they are
17 trying to do. Whether the staff has accepted it or
18 not, we'll find that out when we review Chapter 7.

19 MR. TESFAYE: That is correct.

20 MEMBER STETKAR: Let me ask you one thing
21 in that line, there is one thing in the SER that I
22 tripped over and it had to do with the diesel load
23 sequencing. There were questions about diesel load
24 sequencing back through the protection system. And
25 the conclusion, if I read it correctly says -- it's a

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 long paragraph, and I don't want to read the whole
2 thing if I don't have to. But it says, the staff
3 finds this explanation acceptable because load
4 sequencing is a software-controlled function with
5 appropriate self-testing and checking provisions. So
6 there is at least one area where you see to accept
7 this notion in this SER of testing of that load
8 shedding and load sequencing function.

9 MR. DeMARSHALL: Yes, my thought process
10 there was that, typically, load sequences are actual
11 physical components in the plant. Whereas in this
12 application, it's strictly a software-controlled
13 function. And I didn't -- based on I believe there is
14 like five criteria that we were provided and based on
15 the combination of all five, I was okay with that. I
16 understand the point you are making.

17 MEMBER STETKAR: Let me ask you and see
18 if there is an out and perhaps we don't know is the
19 answer. But there are requirements on a 24-month
20 interval, surveillance requirements to verify that a
21 diesel starts and accepts loads but I don't know how
22 those surveillance requirements are implemented. In
23 other words, if indeed those surveillance requirements
24 test the function of that software to actually strip
25 loads and load it onto the diesel, then indeed there

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 is a commitment for a surveillance to test that
2 function. On the other hand, if it does not strip
3 loads and load them onto the diesel, then it's not
4 clear to me how this particular part of that
5 integrated software system is any different from any
6 of the other functions for safety injection or
7 containment isolation or whatever function.

8 MR. DeMARSHALL: There are -- and I'm
9 going off memory -- but the electrical system tech
10 specs there are 24-month surveillances. There are
11 provisions to check load sequencing.

12 MEMBER STETKAR: It's really a question
13 of how they are implemented, if they actually drop
14 voltage to the bus and verify that indeed the load
15 sequence on actual, not intercepted signals some place
16 higher up in the signal hierarchy, then indeed that
17 would be a true end-to-end functional check if you
18 will, and I was just curious whether you --

19 MR. DeMARSHALL: I did look at that, but
20 I did not base my acceptance on that criteria.

21 MEMBER STETKAR: You based the acceptance
22 on their arguments that --

23 MR. DeMARSHALL: Yes, they -- once again
24 I don't remember what those are off the top of my
25 head.

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 MEMBER STETKAR: I can read them to you
2 if you want. Do you want them? The U.S. EPR design
3 does not have a separate physical load sequencer
4 component which includes relays and time delay
5 circuits. That was number one. Number two, load
6 sequencing is a software-controlled function performed
7 by the protection system where loads are only allowed
8 to be placed on the EDGs after specified conditions
9 are met. Number three, the software utilized by the
10 protection system is highly reliable. Number four,
11 the protection system is designed with self-diagnostic
12 test features to detect both hardware and software
13 faults and a system diagnostic repair activities.
14 Number five, the integrity of the software is checked
15 cyclically as part of the processor's self-monitoring
16 programs, and actually there are six.

17 And number six, an extended self-test
18 which includes a verification of the operating system,
19 is performed every cycle. I don't know what that
20 extended self-test was.

21 MR. DeMARSHALL: I felt that in lieu of -
22 - there is an extraordinary amount of testing that was
23 conducted on this TELEPERM-accessed system. It is
24 true that -- once again we are talking of a software
25 function here. There are no relays or components.

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 Extenuous software testing, not only every 24 months
2 but also continuously. And I felt that, based on that
3 information that I was okay with that decision.

4 Now --

5 MEMBER STETKAR: For the load sequencer,
6 but not for other functions.

7 MR. DeMARSHALL: Well, that --

8 MEMBER STETKAR: Let me not call it the
9 load sequencer, sequencing loads on safety buses.

10 MR. DeMARSHALL: We are talking -- that's
11 electrical tech specs, that particular --

12 MEMBER STETKAR: But in my mind they are
13 analogous, because we are talking -- whether it's a
14 low pressurizer pressure signal that comes through
15 some sort of software logic that eventually tells a
16 safety injection pump to start or whether it's a loss
17 of voltage on a bus that comes through some logic that
18 tells circuit breakers to open and a diesel to start
19 and circuit breakers to close, they all sort of sound
20 the same to me.

21 MR. DeMARSHALL: The protection system is
22 performing that function and that is an IC system
23 through 3.3.1.

24 MEMBER STETKAR: Dana gets concerned if
25 we delve into excruciating details, so I'll pull back

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 from excruciating detail.

2 You have an open issue on resolution of
3 this -- what's called functional-based versus
4 component-based surveillance. Do you see that
5 reaching closure?

6 MR. DeMARSHALL: Actually, we had an
7 audit several weeks ago with AREVA and we plan to have
8 a dedicated meeting to address that issue and several
9 others probably some time third week of this month,
10 prior to the end of this month. And at that time -- I
11 mean that is in my mind one of the biggest issues
12 associated with the instrumentation system design.
13 And we plan to have Chapter 7 people there as well,
14 and I see, if not full resolution at that time,
15 significant progress because that is my goal for that
16 meeting.

17 But I can certainly -- I understand what
18 you are asking with that specific question.

19 MEMBER STETKAR: That was the only place,
20 by the way, in the SER where I saw an acceptance based
21 on their assertions about self-testing features, and
22 highly reliable reliable, never fails kind of stuff.

23 MR. DeMARSHALL: That's a good point. I
24 kind of, in my mind, separated instrumentation tech
25 specs from electrical tech specs when I made that

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 decision. But it is still a protection system.

2 MEMBER STETKAR: I would just hope that
3 in the grand scheme of things, however this whole
4 issue of function, if I can classify it simply as
5 function- versus component-based, that it is at least
6 resolved consistently across the whole protection
7 system, regardless of whether it's being -- start
8 pumps that pump water versus start things that move
9 electrons around.

10 MR. DeMARSHALL: One of the things that I
11 will make sure that we do is during that meeting I'll
12 bring this issue up and I'll make sure we get
13 resolution on it as well.

14 MEMBER RAY: I guess it goes without
15 saying that resolution when we say.

16 MEMBER STETKAR: I would hope so. It's
17 pretty important because it's kind of a fundamental
18 issue of how you verify comparability of -- important
19 things to safety.

20 MEMBER RAY: I understand this isn't the
21 place we're going to talk about the resolution of
22 this.

23 CHAIR POWERS: But understand that the
24 strategy we have here is, we'll come back and we'll
25 look at, reexamine every one of those chapters. The

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 depth and detail of reexamination is something that
2 the Subcommittee will negotiate with all the
3 participants based on level of interest.

4 I believe that we've only seen one chapter
5 with more open items, and even that one we can come
6 back to if we see fit. But right now we are flagging
7 things, and the staff is still doing its work and we
8 are just trying to get a jump on things and all these
9 issues will come back in front of us. Clearly, this
10 is one that we will spend some attention to, probably
11 more in connection with Chapter 7 than Chapter 16, but
12 that obviously has tendrils that move out.

13 MEMBER STETKAR: I think the only danger
14 is in 7, you very quickly go into the details of other
15 things.

16 (Simultaneous speaking.)

17 MEMBER STETKAR: The surveillance
18 requirements are the only place that tell the
19 operators absolutely how to verify what we intend to
20 have verified operable and how to do that.

21 CHAIR POWERS: And for that reason you
22 are right, we may well have to make sure that this
23 whole area gets isolated out. Because this is more of
24 a -- what would you call it -- a performance-based
25 criterion.

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 MR. DeMARSHALL: Peter Kang.

2 MR. KANG: This is Peter Kang again. And
3 traditionally in a sequencer, in emergency diesel
4 generator sequencer was in Chapter 8, with the
5 electrical system. And they were tested every 24
6 months periodically for basically what they are
7 testing is the sequencer, the timing of it. And of
8 course the relay is there and it's also the testing
9 timing, and not like the parameters, the safety
10 parameter comes in and kicking in or anything like
11 that. In an emergency, a loss of offsite power, or a
12 design basis accident, they stripped all the load,
13 okay. Then they did sequencing on one at a time. So
14 in U.S. EPR design, they don't have a sequencer like
15 a mechanical sequencer like a traditional sequence in
16 a sense. But they would have a protection system base
17 which does the same thing, probably more accurate, and
18 also self-testing and Dr. Stetkar was mentioning all
19 the features included in that. So even the power
20 operation to begin, in the old days, you had to have
21 all the offsite power emergency diesel generators
22 available. Also sequencer was available, as one
23 parameter, so you were supposed to be in part of a
24 tech spec. Now in U.S. EPR because they moved it from
25 tech specs, so they don't even have a sequencer to be

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 operable.

2 CHAIR POWERS: Okay.

3 MR. DeMARSHALL: Okay, that concludes my
4 instrumentation surveillance requirements topic. I'd
5 like to move on to post-accident monitoring
6 instrumentation. COL Applicants that reference the
7 U.S. EPR design certification must address Revision 4
8 of Reg Guide 1.97, entitled, Criteria for Accident
9 Monitoring Instrumentation for Nuclear Power Plants.

10 Rev 3 does not provide a criteria for
11 advanced instrumentation designs based on modern
12 digital technology and that is why Rev 4 must be
13 addressed.

14 PAM variable selection criteria in Reg
15 Guide 1.97, Revision 4, depend on the prior
16 development of specific Emergency Operating
17 Procedures, EOPs, and Abnormal Operating Procedures,
18 AOPs, which are post-COL activities. Next slide.

19 COL Applicants must complete site-specific
20 tech spec information in the plant-specific tech specs
21 in accordance with Interim Staff Guidance DC/COL-ISG-
22 8, entitled, Necessary Content of Plant-Specific
23 Technical Specifications when a Combined License is
24 Issued, and this must be done prior to COL issuance
25 using one of the following three options. Option 1

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 provide site-specific tech spec information. Option 1
2 is not practical in this instance because development
3 of EOPs and AOPs are a post-COL license activity.

4 Option 2 provides usable bounding
5 information, i.e. development of a bounding list of
6 PAM functions.

7 And Option 3 relocates site-specific
8 information to a licensee-controlled document and
9 establishes an administrative control tech spec that
10 requires determining information using an approved --
11 an NRC-approved methodology, Reg Guide 1.97 and that
12 controls changes to the information. Next slide.

13 AREVA has proposed a usable bounding list
14 of PAM functions which is Option 2. COL Applicants
15 could incorporate the bounding list by reference, and
16 that is the intent.

17 The staff is evaluating the proposed PAM
18 function list to determine if the list is truly
19 bounding.

20 And that, once again, that evaluation is
21 in progress. Next slide.

22 The remote shutdown system. AREVA
23 proposes to no longer specify the required Remote
24 Shutdown System functions in the generic tech spec and
25 associated basis, which is a deviation from the

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 standard tech spec basis, NUREG-1431, Rev 3. Instead,
2 AREVA proposes that the GTS bases state that the
3 displays and controls at the Remote Shutdown Station
4 are functionally the same as the displays and controls
5 normally used by the operator to achieve and maintain
6 safe shutdown from the Main Control Room.

7 The system that provides these displays
8 and controls at both the Main Control Room and the
9 Remote Shutdown Station is essentially a digital
10 human-machine interface, a digital HMI if you will,
11 with operator work stations located at both the Main
12 Control Room and at the Remote Shutdown Station with
13 control and monitoring capabilities to shut down the
14 plant and maintain it in a safe shutdown condition.

15 The data available at the Remote Shutdown
16 Station is populated from the same information buses
17 that supply data to the Main Control Room. The
18 proposed Remote Shutdown Station tech spec and basis
19 do not identify or provide an FSAR reference that
20 lists the required Remote Shutdown Station functions
21 relied upon to achieve and maintain safe shutdown from
22 outside the Main Control Room. Next slide.

23 It is unclear how to determine the
24 operability requirements of GTS LCO 3.3.3 are met
25 because the limiting condition of operability states

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 Remote Shutdown Station functions shall be operable.

2 Because the Remote Shutdown Station
3 provides operations personnel with the same control
4 and monitoring capabilities as in the Main Control
5 Room, it is unclear based on the LCO whether or not
6 the required Remote Shutdown Station functions relied
7 upon to achieve and maintain safe shutdown from
8 outside the Main Control Room are assured through a
9 select set of safe shutdown functions, a minimum
10 inventory, if you will, and if so, what those
11 functions are.

12 Okay, the last significant open item
13 issue, omission of the manual reactor trip function
14 from the GTS. AREVA has omitted the manual reactor
15 trip function from the GTS on the basis that the trip
16 is not credited in the Chapter 15 accident analysis,
17 and two, that the trip does not satisfy 10 CFR 50.36
18 Criterion 3, which states an SSC -- structure, system
19 or component -- that is part of the primary success
20 path which functions or actuates to mitigate a design
21 basis accident or transient that either assumes
22 failure of or presents a challenge to the integrity of
23 a fission product barrier.

24 The staff questions omission of the manual
25 reactor trip function from the GTS on the basis that

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 the steam generator tube rupture accident analysis in
2 Chapter 15 states, in three cases rapid trip by
3 operator action and concurrent loss of offsite power
4 were postulated to take place at 30 minutes into the
5 accident. A follow-up RAI was issued and the response
6 is pending. Next slide.

7 Staff has conducted a review and
8 evaluation of the U.S. EPR FSAR, which generated 293
9 questions with 30 open items. Through a series of
10 meetings, audits and conference calls the open items
11 have been defined and the staff and AREVA have arrived
12 at a common understanding of the requirements that
13 must be satisfied.

14 Presently, the staff concludes that
15 resolution of the 30 open items is manageable within
16 the planned schedule. Upon resolving the open items,
17 Chapter j16 U.S. EPR FSAR will provide sufficient
18 information to assist the COL Applicant in
19 constructing U.S. EPR that satisfies the requirements
20 of 10 CFR Part 52.

21 That concludes my presentation.

22 MEMBER STETKAR: A question -- this is
23 purely a question; don't read anything into it.

24 CHAIR POWERS: We never read anything
25 into your questions.

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 MEMBER STETKAR: Thank you. I'll stop
2 spending inordinate amounts of time reading this
3 stuff, then.

4 What, historically, in the technical
5 specifications, is there any precedent for treating
6 things like the severe accident depressurization
7 valves in this plant, that we haven't -- I don't think
8 we've seen -- correct me I'm wrong, since I've been
9 wrong at least once today -- we haven't seen Chapter
10 15 yet; have we?

11 MR. WIDMAYER: That is correct.

12 MEMBER STETKAR: Thanks. I don't know,
13 then, whether the severe accident depressurization
14 valves are credited in any of the Chapter 15 analyses.
15 Let's presume that they are not. Is there any
16 precedent for including requirements for the
17 operability of equipment like that in the technical
18 specifications?

19 MR. LE: Severe accident was beyond
20 design basis accident, so the tech spec only cover
21 item that functioned to mitigate the design basis
22 accident.

23 MEMBER STETKAR: Because when I was
24 reading through things, I had questions about those
25 and I had questions about the primary safety release

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 valves which, although they are not, quote-unquote,
2 power-operated relief valves, they are indeed pilot-
3 operated relief valves that can be operated from the
4 control room. And certainly the PRA that we have seen
5 does indeed take credit for operation of both the
6 PSRVs and the severe accident depressurization valves
7 to do things like feed-and-bleed cooling, which again
8 is not necessarily design basis accident mitigation
9 function and they certainly take credit for
10 depressurization for high pressure core-melt scenarios
11 out into Level 2 space.

12 CHAIR POWERS: Now be careful about using
13 the phrase, take credit for.

14 MEMBER STETKAR: They acknowledge it and
15 evaluate it.

16 CHAIR POWERS: That's true, but it is
17 different than taking credit for it in a Chapter 15
18 analysis.

19 MEMBER STETKAR: That is correct.

20 CHAIR POWERS: It's either there or it
21 ain't.

22 MEMBER STETKAR: Right.

23 CHAIR POWERS: Any other comments on this
24 technical specification chapter? As I say, the
25 intention is we will come back and examine each of

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 these chapters again to the depth and detail that the
2 Subcommittee chooses to do and staff and licensees are
3 willing to put up with, I suppose. But so we are not
4 -- this is not the last time we will look at this by
5 intention. The whole strategy is so we can get things
6 moving and if we flag things, as obviously we have on
7 a couple of occasions here, then staff knows to give
8 us more information on that particular item.

9 Any closing comments you would like to
10 make?

11 MR. TESFAYE: Yes, you are absolutely
12 correct; this is not the end of this chapter. We
13 will come back and discuss all the open items and how
14 we closed them. The next activity is on April 21 for
15 the Subcommittee to finish up Chapter 19.

16 CHAIR POWERS: We will come back to that
17 one and I doubt we will finish it again.

18 MR. TESFAYE: But by then we will have
19 finished all the Group 2 chapters.

20 CHAIR POWERS: Right.

21 MR. TESFAYE: And then the next Group 3
22 will be sometime this Summer and early Fall.

23 CHAIR POWERS: Well, I will have to
24 truthfully apologize for dragging this out in such a
25 protracted way but I think we have largely covered

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 these two chapters. I thank everyone for well put
2 together and succinctly presented presentations, both
3 the Applicant and the staff.

4 And with that, I close this Subcommittee
5 meeting.

6 (Whereupon, the above-entitled matter went
7 off the record at 1:58 p.m.)
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

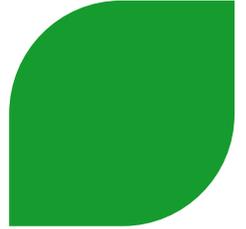
AREVA NP Inc.

Presentation to ACRS U.S. EPR
Subcommittee
Design Certification Application
FSAR Tier 2 Chapter 11

**Pedro B. Perez, Supervisor
Radiological Engineering**

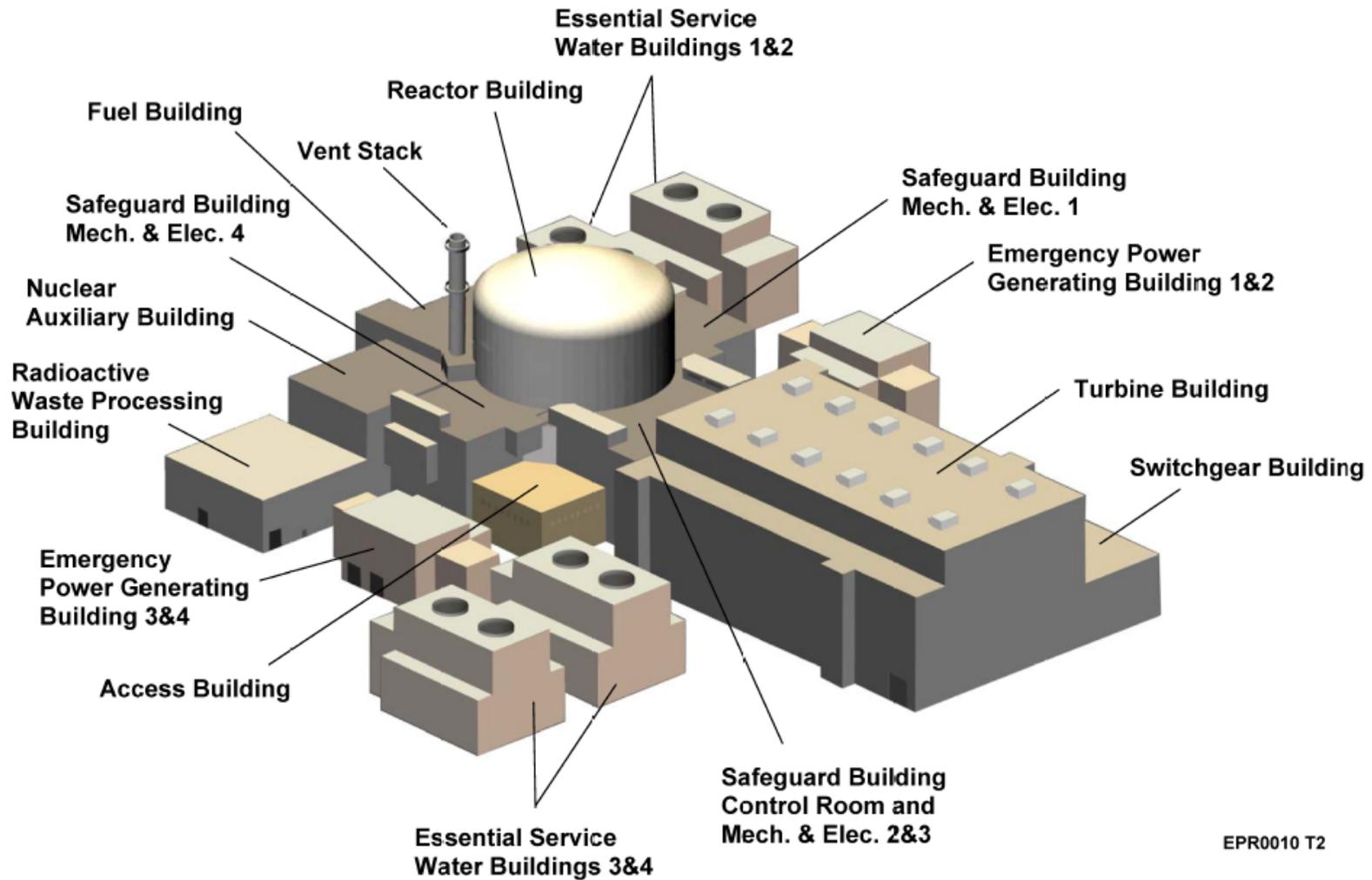
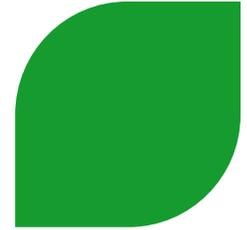


Chapter 11, Radioactive Waste Management: Chapter Topics



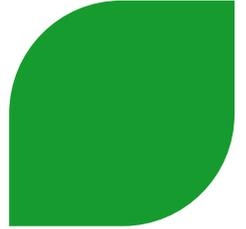
- ▶ **Source Terms – 11.1**
- ▶ **Liquid Waste Management System – 11.2**
- ▶ **Gaseous Waste Management Systems – 11.3**
- ▶ **Solid Waste Management Systems – 11.4**
- ▶ **Process and Effluent Radiological Monitoring and Sampling Systems – 11.5**

Chapter 11, Radioactive Waste Management



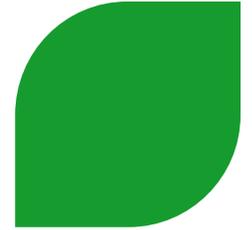
EPR0010 T2

Chapter 11, Radioactive Waste Management: Section 11.1 - Source Terms



- ▶ **The U.S. EPR radiation source terms are summarized in Section 11.1 for normal operations and accident conditions**
 - ◆ **Shielding source term for Chapter 12 was presented to the ACRS in November 2009**
 - ◆ **Design Basis Accident source terms will be presented to the ACRS in the FSAR Chapter 15 presentation (Section 15.0.3)**
- ▶ **Chapter 11 provides normal operations design basis and realistic source terms for the radioactive waste management system**

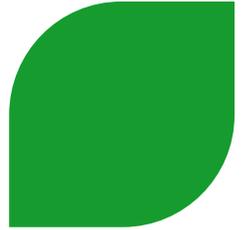
Chapter 11, Radioactive Waste Management: Section 11.1 - Source Terms



▶ Radioactive Waste Management System Design Basis Source Term Derivation

- ◆ Design basis source terms are derived from a bounding core radionuclide inventory
- ◆ ORIGEN 2 parametric cases were run to cover a broad range of operating characteristics
- ◆ Primary and secondary system radionuclide concentrations based on a 1% failed fuel fraction (SRP 11.2)
 - The halogens and noble gases that are set to represent DE I-131 and DE-Xe-133 Technical Specification limit
 - Secondary coolant concentration based on TS primary to secondary leakage rate limit of 600 gallons per day
 - Activation/corrosion products and tritium based on ANSI/ANS 18.1-1999
- ◆ Demonstrate compliance with 10CFR20, Appendix B, Table 2
- ◆ Demonstrate the U.S. EPR meets the design objectives of 10CFR50 Appendix I

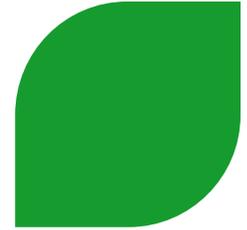
Chapter 11, Radioactive Waste Management: Section 11.1 - Source Terms



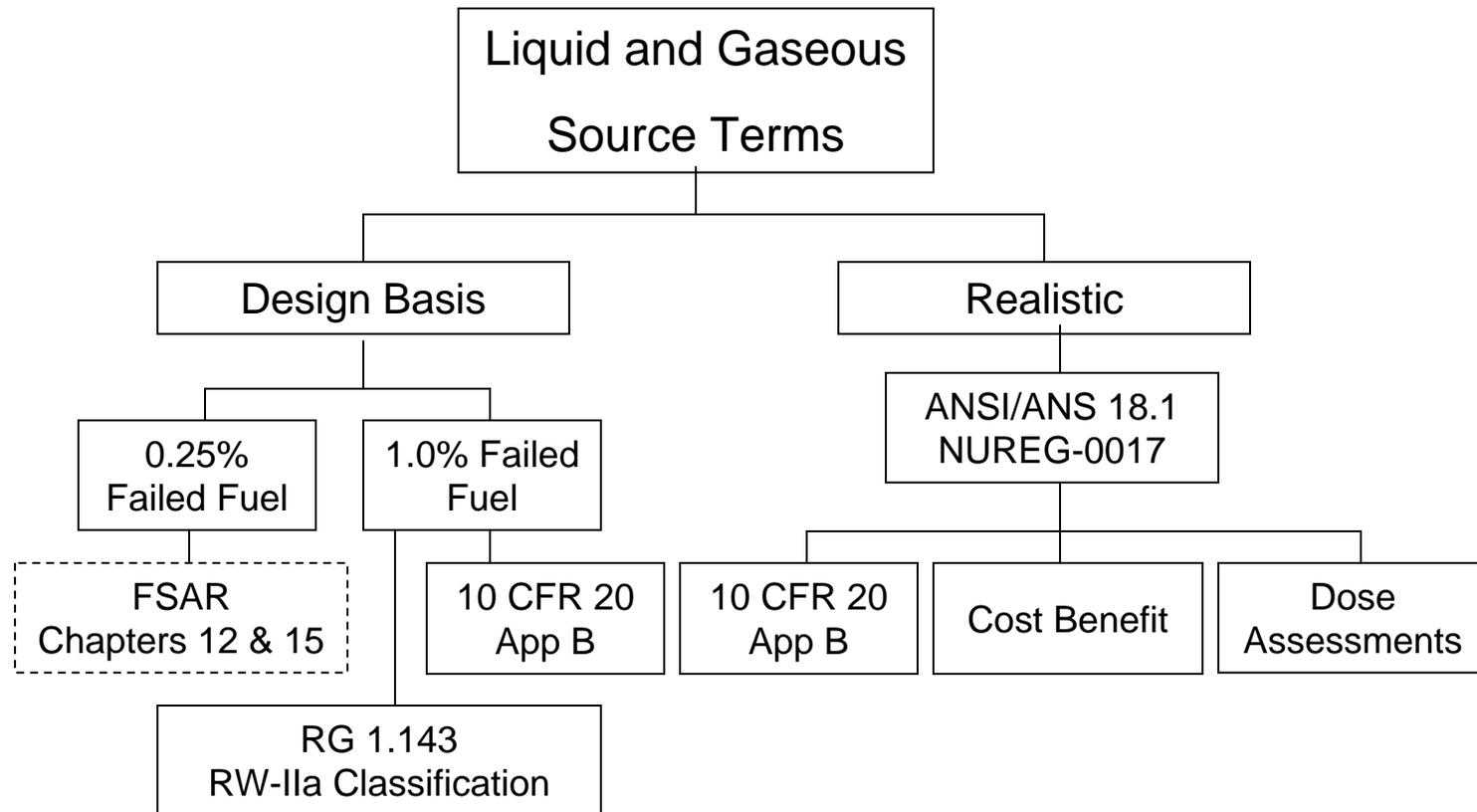
▶ Radioactive Waste Management System Realistic Source Term Derivation

- ◆ Primary and secondary realistic source terms were derived using the model described in ANSI/ANS 18.1-1999
- ◆ Liquid and gaseous effluents from the U.S. EPR were calculated by the GALE code
 - GALE-L – Liquid effluent model description and results follow in Section 11.2
 - GALE-G – Gaseous effluent model description and results follow in Section 11.3
- ◆ Demonstrate compliance with 10CFR20, Appendix B, Table 2

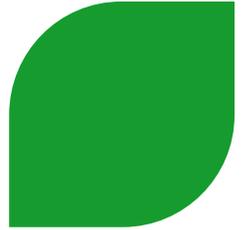
Chapter 11, Radioactive Waste Management: Section 11.1 - Source Terms



► Source Term Summary



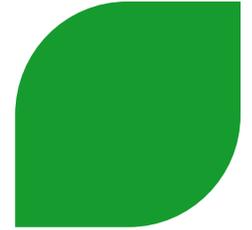
Chapter 11, Radioactive Waste Management: Section 11.2 - Liquid Waste Management System



▶ Cost Benefit Analysis (CBA)

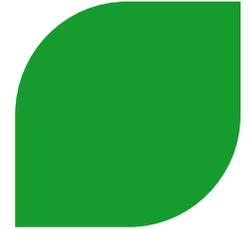
- ◆ CBA performed for LWS and GWS
- ◆ CBA follows RG 1.110 with some differences
 - 60 year equipment life used instead of 30 year
 - \$2000 per person-rem instead of \$1000 per person-rem
 - Equipment cost was not adjusted for inflation

Chapter 11, Radioactive Waste Management: Section 11.2 - Liquid Waste Management System



- ▶ **Liquid Waste Management System**
 - ◆ Collects, processes, and discharges waste liquids
 - ◆ Maintains doses ALARA
- ▶ **Consists of two sub-systems**
 - ◆ Liquid waste storage system
 - ◆ Liquid waste processing system
- ▶ **Liquid waste storage system**
 - ◆ Segregates the liquid waste in five storage tanks
 - ◆ Collects treated waste water in two monitoring tanks and chemically adjusts water to acceptable pH
- ▶ **Liquid waste processing system**
 - ◆ Evaporator
 - ◆ Centrifuge
 - ◆ Demineralizer

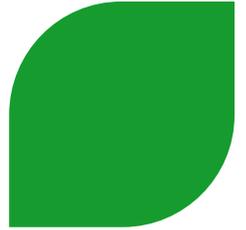
Chapter 11, Radioactive Waste Management: Section 11.2 - Liquid Waste Management System



▶ Liquid waste storage system

- ◆ **Group I liquid waste consists of high activity levels, low levels of organic and inorganic substances and low conductivity**
 - Fuel pool systems, drains, sumps, decontamination operations
 - Normally processed by the evaporator
- ◆ **Group II liquid waste consists of low activity levels, high levels of organic substance and high conductivity**
 - Hot laboratory, showers, washrooms, SG blowdown demineralizer flushing water
 - Normally processed by the centrifuge
- ◆ **Group III liquid waste normally has no activity, but may have high levels of organic substance and conductivity**
 - Non-radioactive floor drains
 - SG blowdown demineralizer flushing water (if not radioactive)
 - If activity exists, waste is processed by the centrifuge
 - If no activity, waste is sent directly to monitoring tank after a short hold-up in storage tank

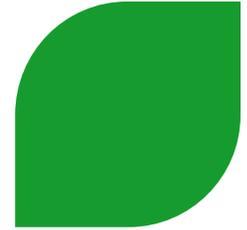
Chapter 11, Radioactive Waste Management: Section 11.2 - Liquid Waste Management System



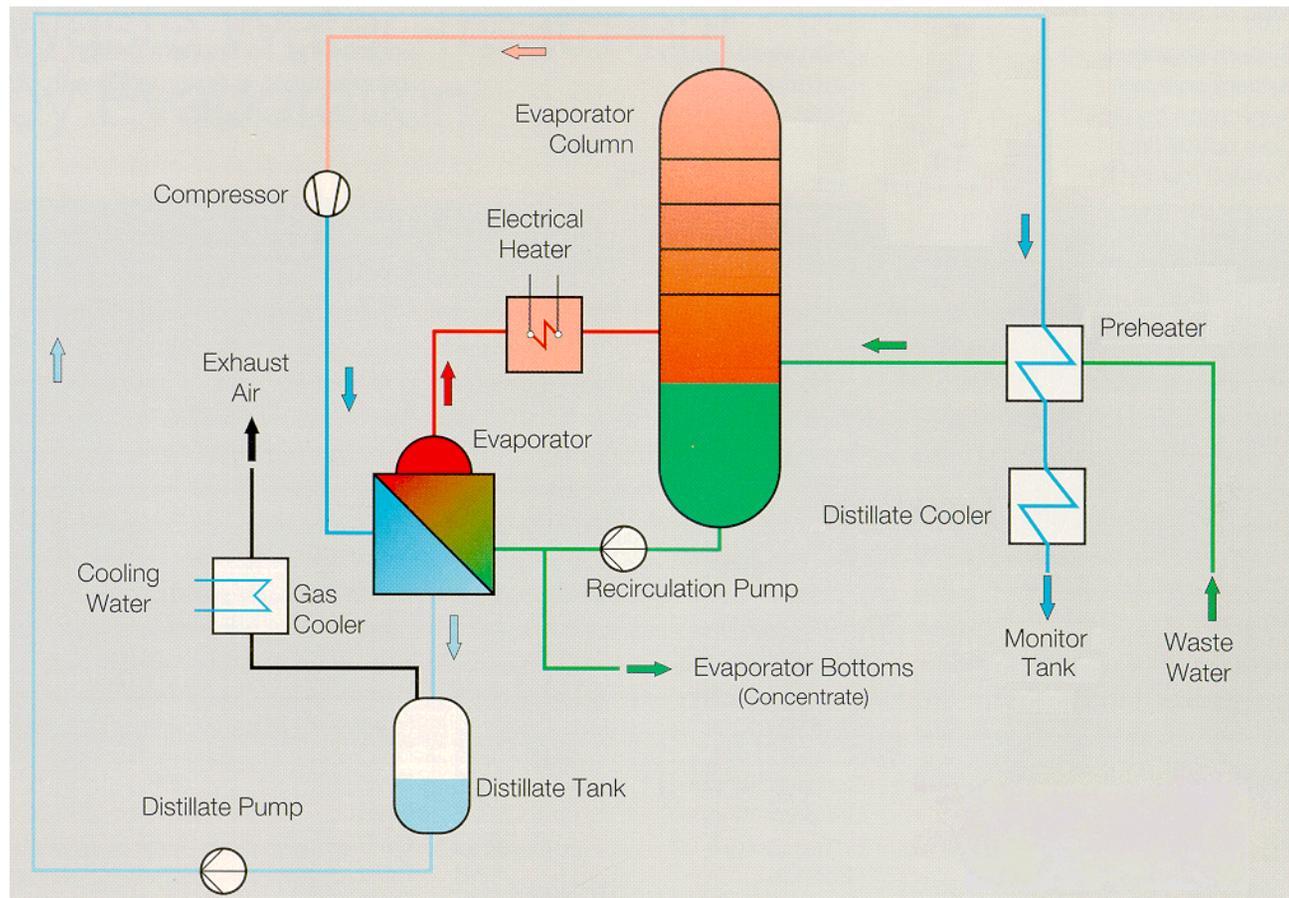
▶ Liquid waste storage system

- ◆ Discharge to the environment is from the monitoring tanks
- ◆ Environmental release is made once radioactivity and pH are within limits
- ◆ Release line is administratively locked and monitored
- ◆ Plant discharges are continuously monitored and recorded in the activity-measurement tank
- ◆ Automatic isolation is provided should activity exceed predetermined limits
- ◆ Liquid waste storage system is RG 1.143 classified as RW-IIa

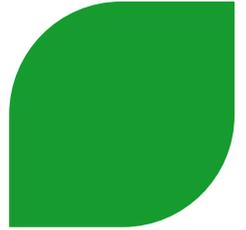
Chapter 11, Radioactive Waste Management: Section 11.2 - Liquid Waste Management System



► Evaporator - vapor-compressor with forced recirculation



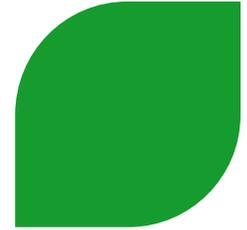
Chapter 11, Radioactive Waste Management: Section 11.2 - Liquid Waste Management System



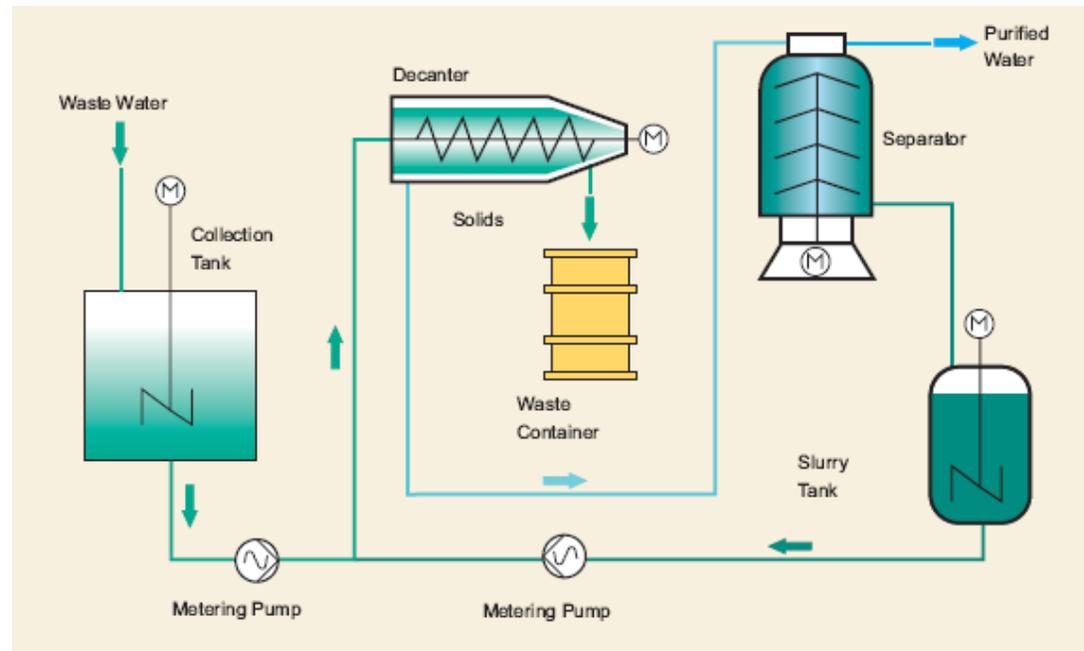
► Evaporator

- ◆ Operated in batch mode
- ◆ Process 1050 gallons per hour
- ◆ Decontamination factor range from 10^4 to 10^7
 - Volatile elements such as halogens DF is 10^4
 - Other nuclides such as Cs-137, Co-60, Mn-54, Sr-90 DF is 10^7

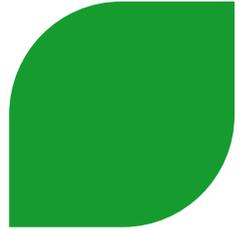
Chapter 11, Radioactive Waste Management: Section 11.2 - Liquid Waste Management System



► Centrifuge



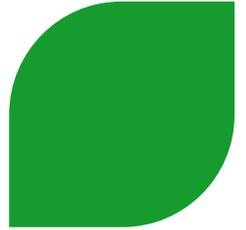
Chapter 11, Radioactive Waste Management: Section 11.2 - Liquid Waste Management System



▶ Centrifuge

- ◆ Operated in batch mode
- ◆ Process 1300 gallons per hour
- ◆ Decontamination factor range from 10^1 to 10^2

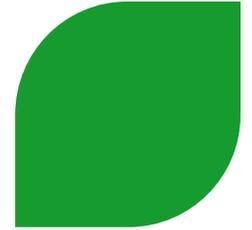
Chapter 11, Radioactive Waste Management: Section 11.2 - Liquid Waste Management System



► Demineralizer

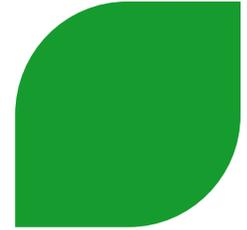
- ◆ Unit commonly used in the U.S.
- ◆ Resin bed configuration include tailoring combinations of resin (anion, cation, mixed)
- ◆ Process 2400 gallons per hour
- ◆ Decontamination factor range from 10^1 – 10^3

Chapter 11, Radioactive Waste Management: Section 11.2 - Liquid Waste Management System



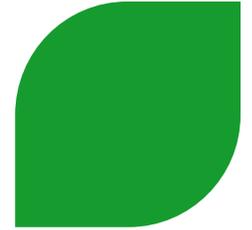
- ▶ **Dose assessments for liquid waste**
- ▶ **GALE-L provides the annual liquid effluent activity**
 - ◆ **Activity expressed in curies released per year and used in LADTAP II**
 - ◆ **Annual activity converted to annual average concentration to demonstrate compliance with 10CFR20 Appendix B Table 2**
 - Realistic source term concentrations
 - Design basis (1% failed fuel fraction) source term concentration
- ▶ **LADTAP II provides doses**
 - ◆ **Maximally Exposed Individual (MEI) dose calculated to comply with the dose objectives of 10CFR50 Appendix I**
 - ◆ **Population dose calculated for the cost benefit analysis**
 - ◆ **Hypothetical sites considered**
 - ◆ **Population dose and cost benefit are COL items**

Chapter 11, Radioactive Waste Management: Section 11.2 - Liquid Waste Management System



- ▶ **LADTAP II (NUREG/CR-4013)**
 - ◆ LADTAP II inputs (FSAR Table 11.2-5)
 - ◆ Maximally Exposed Individual (MEI) and population doses
 - ◆ ALARA Design Objective of 10CFR50 Appendix I
- ▶ **LADTAP II Liquid Pathways for MEI**
 - ◆ Fresh water site type
- ▶ **Dilution and Site Parameters**
 - ◆ Effective discharge point dilution flow rate 100 cfs
 - ◆ MEI site parameters are listed in FSAR Table 11.2-5
 - ◆ COL Item

Chapter 11, Radioactive Waste Management: Section 11.2 - Liquid Waste Management System

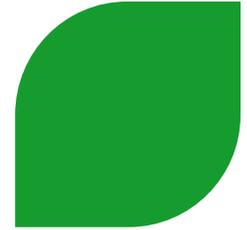


- ▶ **LADTAP II results**
- ▶ **Maximally Exposed Individual (MEI)**

Type of Dose	Calculated (mrem/y)	10CFR50, Appendix I ALARA Design Objective (mrem/y)
Total Body	2.18 (child)	3
Organ Dose	4.83 (infant thyroid)	10

- ▶ **Offsite Dose Calculation Manual (ODCM) – COL Item**

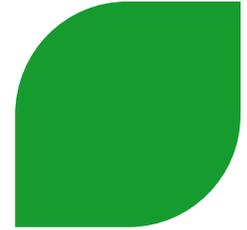
Chapter 11, Radioactive Waste Management: Section 11.2 - Liquid Waste Management System



- ▶ **LADTAP II – population dose**
 - ◆ Applicable only to cost benefit analysis
- ▶ **LADTAP II liquid pathways**
 - ◆ Salt water site type
- ▶ **Results**
 - ◆ Benefit cost ratio is 0.12 based on thyroid dose which is less than 1.0

Augment	Population Total Body Dose (person-rem)	Population Total Thyroid (person-rem)
Demineralizer not used	0.177	0.682
Demineralizer used	0.121	0.222
Obtainable dose benefit	0.06	0.46

Chapter 11, Radioactive Waste Management: Section 11.2 - Liquid Waste Management System



▶ GALE–L effluent concentrations

- ◆ Annual activity converted to annual average concentration to demonstrate compliance with 10CFR20 Appendix B Table 2
 - Realistic source term concentrations
 - Design basis (1% failed fuel fraction) source term concentration

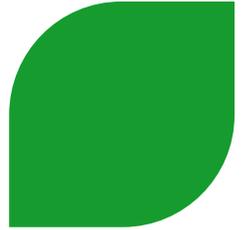
▶ Dilution

- ◆ A dilution factor of 9000 gallons per minute (cooling tower blowdown) was applied to maximize the average release concentration

▶ Results

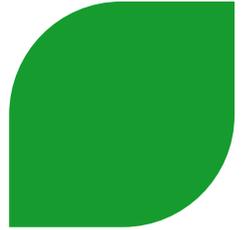
- ◆ Sum-of-the-ratios of the effluent released to concentration limit for the expected release is 0.12, which is well below the allowable value of 1.0
- ◆ Sum-of-the-ratios of the effluent released to concentration limit for the design basis release is 0.62, which is below the allowable value of 1.0

Chapter 11, Radioactive Waste Management: Section 11.2 - Liquid Waste Management System



- ▶ **Abnormal Operation Occurrences – 10CFR20.1406**
- ▶ **Pipe leaks and breaks**
 - ◆ **The liquids from leakages or pipe breaks in the system are collected by sumps in the lowest part of the Radioactive Waste Processing Building**
- ▶ **Failures of vessels, tanks and pumps**
 - ◆ **Rooms which contain storage and concentrate tanks are able to hold the content of a complete tank in the segregated compartments**
 - ◆ **The rooms are connected according to the waste water groups. A leakage sensor monitors each waste water group**

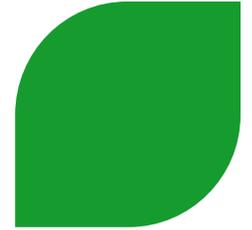
Chapter 11, Radioactive Waste Management: Section 11.2 - Liquid Waste Management System



▶ Radioactive Liquid Waste System Leak or Failure

- ◆ Unrestricted area water concentration from unmitigated liquid release
- ◆ SRP BTP 11-6 and DC/COL ISG-013 and 14
- ◆ Unrestricted area assumed at 1200 feet from Auxiliary Building
- ◆ Total release rate based on entire volume of 5 tanks
- ◆ Discharge concentration are at the immediate vicinity of the discharge point
- ◆ H-3, Fe-55 and Co-60 the only significant nuclides at the discharge point
- ◆ FSAR Table 11.2-8 demonstrates compliance with 10CFR20 Appendix B

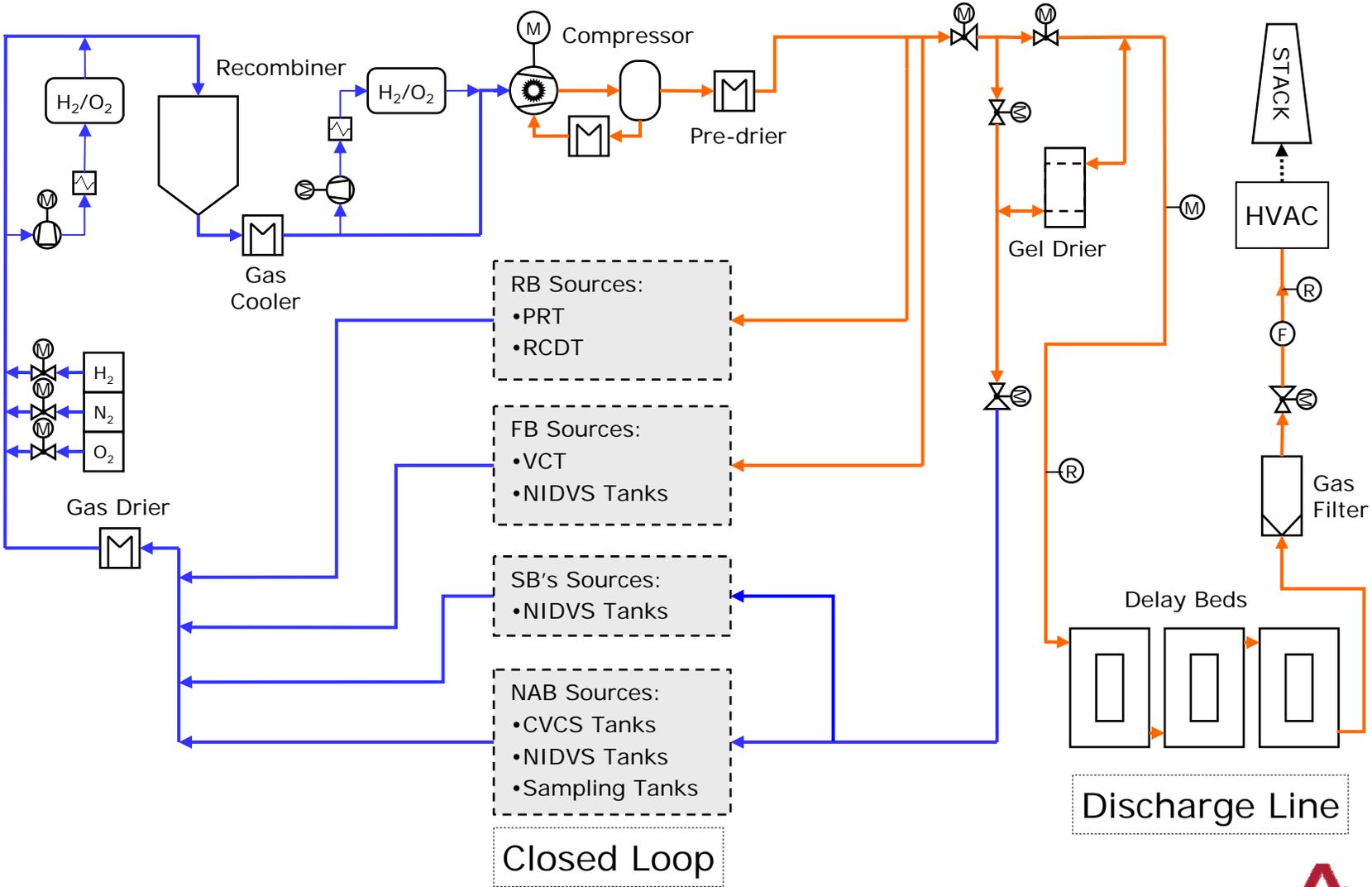
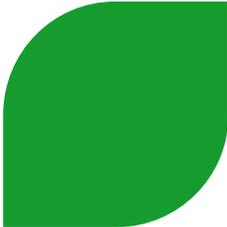
Chapter 11, Radioactive Waste Management: Section 11.3 - Gaseous Waste Management Systems



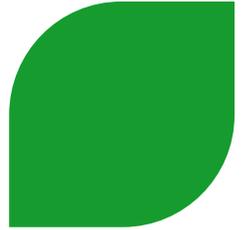
▶ Gaseous Waste Processing System

- ◆ Collects, processes, and discharges waste gases
- ◆ Maintains doses ALARA
- ◆ Controls explosive gases - Limiting concentrations: $O_2 < 2\%$ / $H_2 < 4\%$
- ◆ RG 1.143 classified as RW II-a

Chapter 11, Radioactive Waste Management: Section 11.3 - Gaseous Waste Management Systems

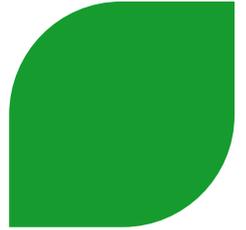


Chapter 11, Radioactive Waste Management: Section 11.3 - Gaseous Waste Management Systems



- ▶ **GWS – Modes of operation**
- ▶ **Normal**
 - ◆ Routine operation
 - ◆ No significant gas releases to the auxiliary building ventilation system
- ▶ **GWS - Surge operation mode**
 - ◆ Operating mode for about 1% of the system's annual operating time
 - ◆ During plant start-up the expansion water from the primary circuit reduces the free gas volume available in the coolant storage tanks. Thus, the gas is vented to the GWS
 - ◆ During outage preparation (i.e. draining) the excess gas generated from degasification of the reactor coolant is sent to the GWS

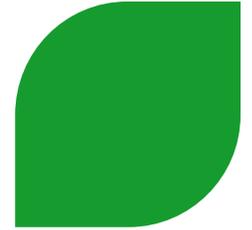
Chapter 11, Radioactive Waste Management: Section 11.3 - Gaseous Waste Management Systems



► Delay Beds

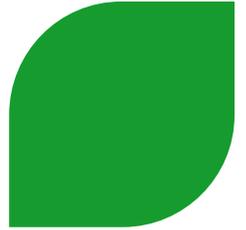
- ◆ Retain Xenon and Krypton in activated charcoal media
- ◆ Three vertical pressure vessels
- ◆ N₂ flow rate of about 7.3 cfm
- ◆ Charcoal mass 5440 lbm per bed
- ◆ Hold-up time for Xenon is 27.7 days
- ◆ Hold-up time for Krypton is 40 hours

Chapter 11, Radioactive Waste Management: Section 11.3 - Gaseous Waste Management System



- ▶ **Dose assessments for gaseous waste**
- ▶ **GALE-G provides the annual gaseous effluent activity**
 - ◆ **Activity expressed in curies released per year and used in GASPAR II**
 - ◆ **Annual activity converted to annual average concentration to demonstrate compliance with 10CFR20 Appendix B Table 2**
 - Realistic source term concentrations
 - Design basis (1% failed fuel fraction) source term concentration (except halogens and noble gases which are at Technical Specification limits)
- ▶ **GASPAR II provides doses**
 - ◆ **Maximally Exposed Individual (MEI) dose calculated to comply with the dose objectives of 10CFR50 Appendix I**
 - ◆ **Population dose calculated for the cost benefit analysis**
 - ◆ **Hypothetical sites considered**
 - ◆ **Population dose and cost benefit are COL items**

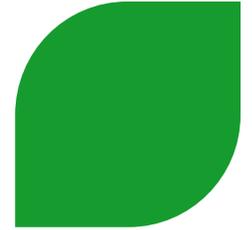
Chapter 11, Radioactive Waste Management: Section 11.3 - Gaseous Waste Management System



► Key GALE-G input

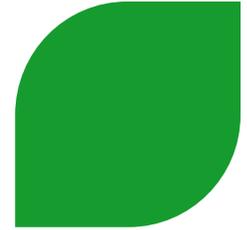
- ◆ HEPA filter efficiency is 99%
- ◆ Charcoal filter efficiency is 90%
- ◆ Hold-up time for Xenon 27.7 days
- ◆ Hold-up time for Krypton is 40 hours
- ◆ Containment free volume is 2.8E+06 cubic feet
- ◆ Containment internal clean-up rate is 4.1E+03 cfm
- ◆ Containment purge flow rate is 3210 cfm (RAI 273)
- ◆ Condenser air ejector released without treatment

Chapter 11, Radioactive Waste Management: Section 11.3 - Gaseous Waste Management System



- ▶ **GALE-G Results - Effluent release from the plant stack**
 - ◆ Elevation of about 200 feet from plant grade and about 7 feet above the top of the reactor building
 - ◆ Total stack flow is about 240,000 cfm
 - ◆ Atmospheric dispersion and ground deposition factors are based on conservative values for a 0.5 mile distance from the reactor centerline to the site boundary and a mixed-mode release
 - ◆ **Exposure Pathways**
 - External exposure to contaminated ground
 - External exposure to noble gases in airborne plume
 - Inhalation
 - Ingestion of vegetables, milk and meat

Chapter 11, Radioactive Waste Management: Section 11.3 - Gaseous Waste Management System



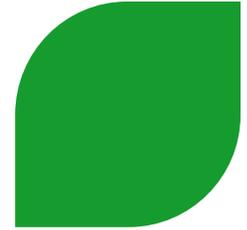
► GASPAR II dose results

- ◆ Maximally Exposed Individual (MEI) dose calculated to comply with the dose objectives of 10CFR50 Appendix I

Type of Dose	Calculated	10CFR50, Appendix I ALARA Design Objective
Beta Air (mrad/y)	13.3	20
Gamma Air (mrad/y)	1.62	10
Total Body	1.03	5
Skin (mrem/y)	9.76	15
Organ Dose (mrem/y)	9.9 (infant thyroid)	15

► Offsite Dose Calculation Manual (ODCM) – COL Item

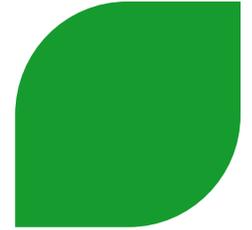
Chapter 11, Radioactive Waste Management: Section 11.3 - Gaseous Waste Management System



- ▶ **GASPAR II – population dose**
 - ◆ Applicable only to cost benefit analysis
- ▶ **GASPAR II pathways**
 - ◆ Stack releases
 - ◆ Exposure Pathways: external, inhalation, ingestion of vegetation, milk and meat
- ▶ **Results**
 - ◆ Benefit cost ratio is 0.05 based on thyroid dose which is less than 1.0

Augment	Population Total Body Dose (person-rem)	Population Total Thyroid (person-rem)
Base Line	5.52	5.80
Additional Delay Bed	5.49	5.77
Obtainable dose benefit	0.03	0.03

Chapter 11, Radioactive Waste Management: Section 11.3 - Gaseous Waste Management System



▶ GALE–G Effluent concentrations

- ◆ Annual activity converted to annual average concentration to demonstrate compliance with 10CFR20 Appendix B Table 2

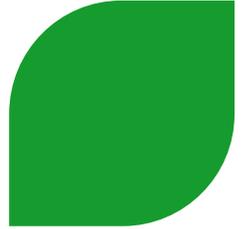
▶ Atmospheric dispersion

- ◆ Annual average at 0.5 miles from reactor centerline assuming a mixed-mode release

▶ Results

- ◆ Sum-of-the-ratios of the effluent released to concentration limit for the expected release is 0.02, which is well below the allowable value of 1.0
- ◆ Sum-of-the-ratios of the effluent released to concentration limit for the design basis release is 0.10, which is well below the allowable value of 1.0

Chapter 11, Radioactive Waste Management: Section 11.3 - Gaseous Waste Management System



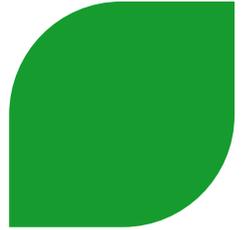
▶ Radioactive Gaseous Waste System leak or failure

- ◆ Pressurized sections are designed with a high degree of leak tightness
 - Example: Liquid ring compressors are used to avoid an ignition source and canned motor guarantees a sealed motor compressor
- ◆ Sub-atmospheric system prevents leakage
- ◆ Hydrogen and oxygen concentrations are controlled to prevent detonation

▶ Bounding analysis

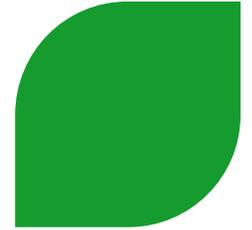
- ◆ Operator error leads to bypassing delay bed and releasing effluent from coolant degasification for one hour
- ◆ Based on a 1 hour release, the exclusion area boundary dose is less than 100 mrem in accordance with BTP 11-5

Chapter 11, Radioactive Waste Management: Section 11.4 - Solid Waste Management Systems



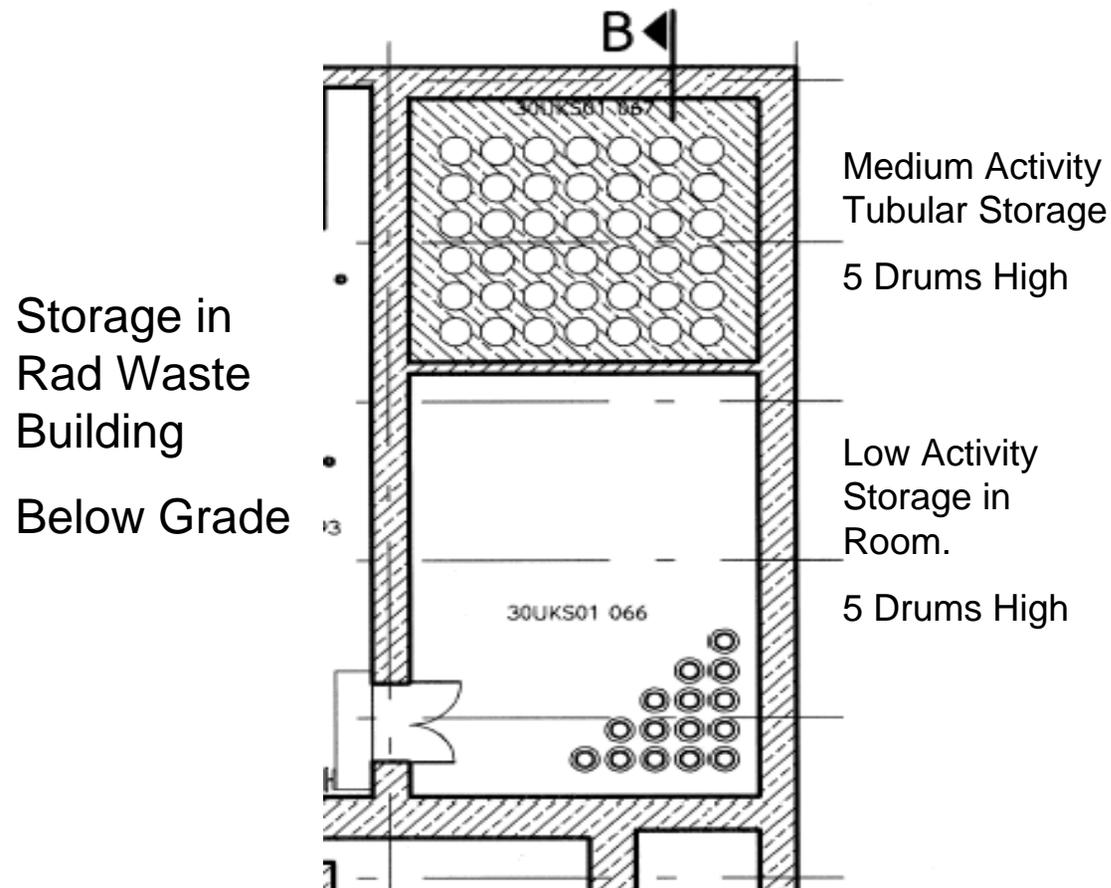
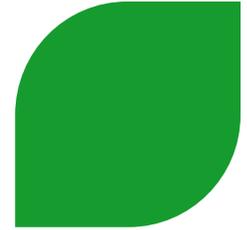
- ▶ **Solid Waste Management System**
 - ◆ Radioactive Concentrate Processing System
 - ◆ Solid Waste Processing System
 - ◆ Solid Waste Storage System
- ▶ **Process concentrates from evaporator bottom**
- ▶ **Process sludge from storage tank bottoms**
- ▶ **Process spent resin from primary and secondary coolant purification and liquid waste demineralizer systems**

Chapter 11, Radioactive Waste Management: Section 11.4 - Solid Waste Management Systems

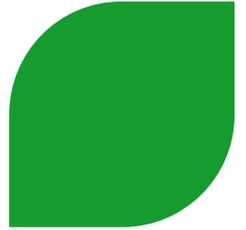


- ▶ **Solid waste volume reduction**
 - ◆ Shredding device
 - ◆ Solid Waste drying
 - ◆ Compaction
 - ◆ Sorting box
- ▶ **A drum store room for low activity waste in drums**
- ▶ **A concrete tubular shaft storage area for medium and high activity waste**
- ▶ **Several years storage capacity for Type B&C**
- ▶ **Process Control Program (PCP) – COL Item**

Chapter 11, Radioactive Waste Management: Section 11.4 - Solid Waste Management Systems

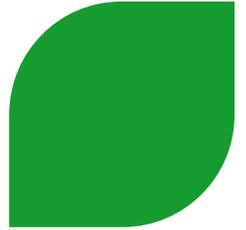


Chapter 11, Radioactive Waste Management: Section 11.5 - Process and Effluent Radiological Monitoring and Sampling Systems



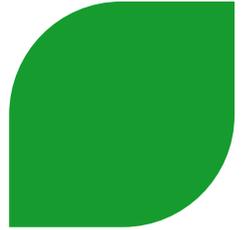
- ▶ **Effluent radiological monitoring and sampling**
- ▶ **Gaseous effluents**
 - ◆ **Reactor building**
 - ◆ **Fuel building**
 - ◆ **Nuclear auxiliary building**
 - ◆ **Safeguard building mechanical area**
 - ◆ **Radioactive waste processing building**
 - ◆ **Controlled areas of the access building**
 - ◆ **Condenser air ejector**
- ▶ **Vent stack gaseous sampling system**
 - ◆ **Noble gas activity is monitored with gamma and beta**
 - ◆ **Aerosol activity is monitored with gamma-sensitive detector**
 - ◆ **Iodine activity is monitored by a dual filter for organic and inorganic iodine**

Chapter 11, Radioactive Waste Management: Section 11.5 - Process and Effluent Radiological Monitoring and Sampling Systems



- ▶ **Effluent radiological monitoring and sampling**
 - ◆ **Concentrations meet 10CFR20 Appendix B**
 - ◆ **Effluents meet ALARA design objectives of 10CFR50 Appendix I**
 - ◆ **Effluents comply with 40CFR190**
 - ◆ **Provide inputs to the Offsite Dose Calculation Manual (ODCM)**
 - ◆ **Support preparation of effluent reports**

Chapter 11, Radioactive Waste Management: Section 11.5 - Process and Effluent Radiological Monitoring and Sampling Systems



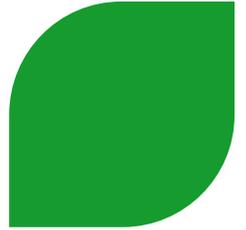
▶ Process monitoring and sampling

- ◆ Early detection of a radioactive material migration
- ◆ Minimization of contamination (10CFR20.1406)
- ◆ Maintain occupational and off-site doses ALARA

▶ Process monitors

- ◆ Main Steam Radiation Monitoring System
 - Primary indication of a steam generator tube rupture
- ◆ Steam Generator Blow-down System
 - Second means for detecting a steam generator tube rupture
 - Chemical sample analysis
- ◆ Condenser Air Removal Radiation Monitoring System
 - Noble gas activity
- ◆ Component Cooling Water Radiation Monitoring System
 - Monitors components such as coolers (heat exchanger) integrity

Chapter 11, Radioactive Waste Management: Section 11.5 - Process and Effluent Radiological Monitoring and Sampling Systems



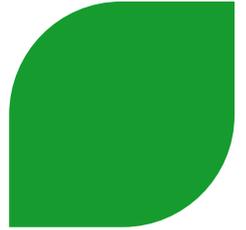
▶ Process monitors

- ◆ Gaseous waste disposal radiation monitoring system
 - Delay bed monitoring - down-stream (β for kr-85) and up-stream (γ)
- ◆ Reactor coolant radiation monitoring and sampling system
 - Coolant noble gas activity
- ◆ Chilled water Supply for the gaseous waste disposal Sampling System
 - Monitor integrity of component such as heat exchangers

▶ Automatic protective actions

- Containment high range monitors
- Fuel building air exhaust monitoring
- Main control room air intake monitoring

Chapter 11, Radioactive Waste Management Acronyms



- ▶ **ALARA – As Low As Reasonably Achievable**
- ▶ **COL – Combined Operating License**
- ▶ **ECCS – Emergency Core Cooling System**
- ▶ **ESF – Engineered Safety Features**
- ▶ **GWS – Gaseous Waste System**
- ▶ **LWS – Liquid Waste System**
- ▶ **MEI – Maximally Exposed Individual**
- ▶ **ODCM – Offsite Dose Calculation Manual**
- ▶ **PCP – Process Control Program**
- ▶ **RCS – Reactor Coolant System**
- ▶ **SG – Steam Generator**



Presentation to the ACRS Subcommittee

AREVA U.S. EPR Design Certification Application Review

Safety Evaluation with Open Items: Chapter 11

RADIOACTIVE WASTE MANAGEMENT

April 6, 2010

Staff Review Team

- **Technical Staff**

- ♦ **Michelle Hart** – Section 11.1
Siting and Accident Consequences Branch
- ♦ **Jean-Claude Dehmel** – Sections 11.2 to 11.5
Construction Health Physics Branch
- ♦ **Joshua Wilson** – Sections 11.2 to 11.4
Balance of Plant Branch

- **Project Managers**

- ♦ **Getachew Tesfaye** – Lead Project Manager
- ♦ **Jason Jennings** – Chapter Project Manager

Overview of DCA

SRP Section/Application Section		Number of Questions	Number of Open Items
11.1	Source Terms	4	0
11.2	Liquid Waste Management System	18	8
11.3	Gaseous Waste Management System	15	4
11.4	Solid Waste Management Systems	14	6
11.5	Process and Effluent Radiological Monitoring and Sampling Systems	20	6
Totals		71	24

Description of SE Open Items – FSAR Sect. 11.2 Liquid Waste Management System

- **RAI 273 Question # 11.02-5:** Describe how the use of chelating and anti-foaming agents will not degrade the performance and integrity of the LWMS demineralizer system.
- **RAI 273 Question # 11.02-14 and RAI 301 Question # 11.02-17:** Provide information used in calculating offsite doses using the LADTAP II code.
- **RAI 299 Question # 11.02-16:** Provide supporting information used in developing the liquid effluent radioactive source term.
- **RAI 273 Question # 11.02-15:** Update listing of LWMS components for consistency among FSAR descriptions, tables, and figures.
- **RAI 301 Question # 11.02-17(4):** Provide supporting information used in LWMS cost-benefit analyses.
- **RAI 301 Question # 11.02-17(5):** Provide information used in assessing the offsite radiological impacts of the postulated failure of a LWMS radioactive waste tank.
- **RAI 359 Question # 11.02-18:** Provide information describing the elements of a QA program for the design, fabrication, procurement, and installation of the LWMS using the guidance of RG 1.143.

Description of SE Open Items – FSAR Sect. 11.3 Gaseous Waste Management System

- **RAI 273 Question # 11.03-12:** Provide supporting information used for the GWMS cost-benefit analyses.
- **RAI 273 Question # 11.03-13:** Provide supporting information used for the analysis of the postulated failure of a GWMS component.
- **RAI 299 Question # 11.03-14:.** Provide information supporting the development of the gaseous effluent radioactive source term.
- **RAI 301 Question # 11.03-15:** Provide supporting information used in calculating offsite doses using the GASPAR II code.

Description of SE Open Items – FSAR Sect. 11.4 Solid Waste Management System

- **RAI 273 Question # 11.04-8:** Provide information supporting the conclusion that the radioactive waste processing building can store Class B and C radioactive wastes for several years.
- **RAI 273 Question # 11.04-10:** Update listing of SWMS components for consistency among FSAR descriptions, tables, and figures.
- **RAI 273 Question # 11.04-11:** Update listing of expected radioactive waste streams to include spent-charcoal, dessicant, and HEPA filters.
- **RAI 273 Question # 11.04-12:** Update the acceptance criteria for the presence of free standing liquid in waste for consistency with the requirements of Part 61.56.
- **RAI 273 Question # 11.04-13:** Describe how the design of the SWMS will comply with the requirements of 10 CFR 20.1406 and guidance of RG 4.21 and issues identified in IE Bulletin 80-10.
- **RAI 273 Question # 11.04-15:** Revise inconsistent estimates of yearly low level waste activity shipped.

Description of SE Open Items – FSAR Sect. 11.5 Process and Effluent Radiological Monitoring and Sampling Systems

- **RAI 273 Question # 11.05-1:** Update descriptions of the design basis given the guidance in SRP Section 11.5 and RG 1.206.
- **RAI 273 Question # 11.05-2:** Update the description of the operational characteristics of process and effluent radiation monitoring instrumentation.
- **RAI 276 Question # 11.05-13:** Describe the radiation monitoring equipment response characteristics in complying with TS 16.3.4.12.b on the allowable RCS leakage rate of 1 gal/min.
- **RAI 276 Question # 11.05-14:** Update description of radiation monitoring instrumentation and sampling systems for consistency among FSAR Sections 1.9, 7.1, 7.5, 9.3.2, and 11.5, given TMI-related requirements of 10 CFR 50.34(f)(2), and guidance of SRP Sections 9.3.2 and 11.5 and RGs 1.21 and 1.206.
- **RAI 290 Question # 11.05-15:** Update the description of the liquid effluent release path from the Radioactive Waste Processing Building to the point of discharge, and provide information supporting system blowdown and dilution flow rates at the point of discharge.
- **RAI 346 Question # 11.05-20:** Describe the radiation monitoring equipment response characteristics in complying with TS 16.3.4.12.d on the allowable SG leakage rate of 150 gal/d.

Technical Topics of Interest

Section 11.1 – Source Terms

Section 11.1 SER – No Open Items:

- Input for radwaste systems analyses and design basis accident radiological consequences analyses
- Coolant source terms based on ANSI/ANS-18.1-1999
 - ♦ PWR-GALE code
- Core isotopic inventory developed using ORIGEN-2.1
- Applicant followed SRP 11.1 and RG 1.112
- Key SRP Interfaces: 11.2, 11.3, 12.2 to 12.4, and 15.0.3
- No COL Information Items
- No Open Items

Technical Topics of Interest

Sect. 11.2 – Liquid Waste Management System



Section 11.2 SER with Open Items:

- Processing methods: evaporation, centrifugal separation, ultra-filtration, and demineralization.
- Equipment design basis and features, system descriptions, processing methods, and capacities; seismic and quality group classifications; performance characteristics; instrumentation systems; automatic termination of effluent release; estimated waste throughput; ALARA design features; and definition of discharge path.
- Basis and development of liquid process waste streams, estimates of liquid waste volumes, treatment performance (DF), and liquid effluent source term.
- Assumptions and parameters used in complying with effluent concentration limits at the point of discharge.
- Assumptions and parameters used in complying with Part 20 dose limits for members of the public, Part 50, Appendix I design objectives, and cost-benefit ratio.

Technical Topics of Interest

Sect. 11.2 – Liquid Waste Management System



Section 11.2 SER with Open Items:

- Assumptions and parameters used in assessing radiological impacts of a postulated failure of a LWMS tank.
- Minimization of contamination, Tier 1 and ITAAC information, technical specifications, and pre-operational testing.
- Key SRP interfaces: 9.2, 9.3, 9.4, 10.3, 10.4, 11.5, 14.2, and 16.
- COL Information Item
 - ♦ COL applicant will develop a site-specific CBA if FSAR LWMS CBA is not applicable for the proposed COLA site.

Technical Topics of Interest

Sect. 11.3 – Gaseous Waste Management System

Section 11.3 SER with Open Items:

- Waste gas processing methods: recombiner, charcoal delay and dessicant beds, and gas filters.
- Building ventilation exhaust systems: HEPA and charcoal filters.
- Equipment design basis and features, system descriptions, processing methods, and capacities; seismic and quality group classifications; performance characteristics; instrumentation systems; recombiner and explosive gas mixture controls; automatic isolation of process flow and effluent releases; estimated waste throughput; ALARA design features; and definition of release point.
- Basis and development of gaseous process waste streams, recombiner processing rate, purge modes; treatment process performance (removal efficiencies and holding times), and gaseous effluent source terms for gas stripping, air ejectors, and building ventilation systems.
- Assumptions and model parameters used in complying with effluent concentration limits at the EAB.

Technical Topics of Interest

Sect. 11.3 – Gaseous Waste Management System



Section 11.3 SER with Open Items:

- Assumptions and parameters used in complying with Part 20 dose limits for members of the public, and Part 50, Appendix I design objectives, and cost-benefit ratio.
- Assumptions and model parameters used in assessing the radiological impacts of a postulated failure of a waste gas process component.
- Minimization of contamination, Tier 1 and ITAAC information, technical specifications, and pre-operational testing.
- Key SRP interfaces: 6.2, 9.3, 9.4, 10.3, 10.4, 11.2, 11.5, 14.2, and 16.
- COL Information Item
 - ♦ COL applicant will develop a site-specific CBA if FSAR GWMS CBA is not applicable for the proposed COLA site.

Technical Topics of Interest

Sect. 11.4 – Solid Waste Management System



Section 11.4 SER with Open Items:

- Solid waste processing/storage methods: sorting box, shredder, compactor, and drum store and tubular storage facilities.
- Waste concentrates and wet wastes processing methods: tanks, resin traps, condenser drying units, vacuum units, drying stations, a transfer station, a sampling station, and a drum measuring system.
- Equipment design basis and features, system descriptions, processing methods, and capacities; seismic and quality group classifications; performance characteristics; instrumentation systems; automatic isolation of process; yearly estimate of waste generation rates; ALARA design features; capability to move drums and HICs; and use of supplemental skid-mounted processing systems.
- Storage facilities and basis for expected storage capacity for Class A, B, and C wastes.

Technical Topics of Interest

Sect. 11.4 – Solid Waste Management System



Section 11.4 SER with Open Items:

- No direct liquid and gaseous effluent releases from SWMS. Associated releases and compliance with ECLs and dose limits are addressed in FSAR Section 11.2 (LWMS) and Section 11.3 (GWMS).
- Minimization of contamination, Tier 1 and ITAAC information, technical specifications, and pre-operational testing.
- Key SRP interfaces: 9.3, 9.4, 11.2, 11.3, 11.5, 13.4, 14.2 and 16.

Technical Topics of Interest

Sect. 11.4 – Solid Waste Management System

- COL Information Item
- Process Control Program (PCP)
 - Description of the operational program for the processing of Class A, B, and C low-level wastes in accordance with 10 CFR 61.55 and 61.56.
 - FSAR adopts NEI PCP Template 07-10A until a plant-specific PCP is developed to support plant operation.
 - Approach acceptable given staff endorsement of NEI PCP template.

Technical Topics of Interest

Sect. 11.5 – Process and Effluent Radiological Monitoring and Sampling Systems



Section 11.5 SER with Open Items:

- Plant process systems and effluent flow paths monitored by radiation monitoring and sampling equipment.
- Equipment design basis and features, system descriptions, types, number, and locations of instrumentation; types and location of process and effluent sampling systems; seismic and quality group classifications; operational ranges and sensitivities or detection limits; system calibrations and provisions for built-in check sources; provisions for automatic isolation and termination features; and ALARA design features.
- PERMSS does not generate process waste; system returns sampled process and effluent streams to their points of origin.

Technical Topics of Interest

Sect. 11.5 – Process and Effluent Radiological Monitoring and Sampling Systems



Section 11.5 SER with Open Items:

- Minimization of contamination, Tier 1 and ITAAC information, technical specifications, and pre-operational testing.
- Key SRP interfaces: 6.2.3, 5.2.5, 7.1, 7.5, 9.3.2, 9.4, 10.4, 11.2, 11.3, 11.4, 11.5, 13.4, 14.2, and 16.

Technical Topics of Interest

Sect. 11.5 – Process and Effluent Radiological Monitoring and Sampling Systems

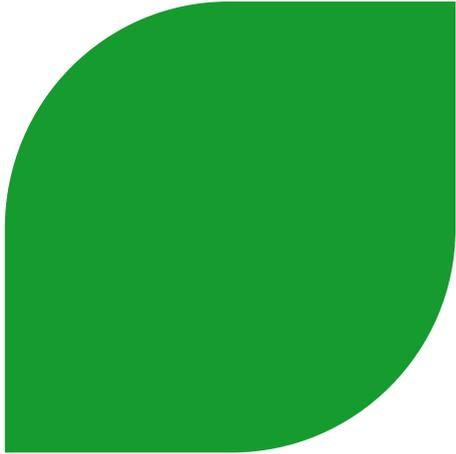
- COL Information Item
- Offsite Dose Calculation Manual (ODCM)
 - Description of the operational program for controlling and monitoring all effluent releases and assessing offsite doses in accordance with 10 CFR 20.1301 and 20.1302; 40 CFR Part 190 as referenced in 10 CFR 20.1301(e); 10 CFR Part 20, Appendix B, Table 2 ECLs; and design objectives of Appendix I to 10 CFR Part 50.
 - FSAR adopts NEI ODCM Template 07-09A until a plant and site-specific ODCM is developed to support plant operation.
 - Approach acceptable given staff endorsement of NEI ODCM template.

CONCLUSIONS - Chapter 11

- **Remaining open items associated with:**
 - technical clarifications and information supporting the design basis and descriptions of treatment systems and radiation monitoring and sampling equipment.
 - confirmation of the estimates of liquid and gaseous effluent source terms, associated offsite doses, and compliance with 10 CFR Part 20 and 50 requirements.
 - Resolution of open items expected based on RAI responses.
 - Resolution of confirmatory items will be completed pending receipt and review of FSAR revision.
- **Significant COL items:**
 - PCP, ODCM, and cost-benefit analyses.

ACRONYMS

- ALARA – As Low As is Reasonably Achievable
- CBA – Cost-Benefit Analysis
- COL – Combined License
- ECL – Effluent Concentration Limit
- GDC – Generic Design Criteria
- GWMS – Gaseous Waste Management System
- HEPA – High Efficiency Particulate Air
- LOCA – Loss Of Coolant Accident
- LWMS – Liquid Waste Management System
- MEI – Maximally Exposed Individual
- RAI – Request for Additional Information
- RCS – Reactor Coolant System
- RG – Regulatory Guide
- SE – Safety Evaluation
- SRP – Standard Review Plan
- SWMS – Solid Waste Management System
- TS – Technical Specifications

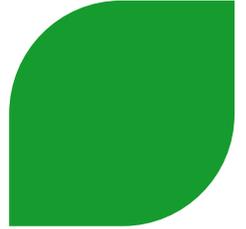


Presentation to ACRS U.S. EPR Subcommittee Design Certification Application FSAR Tier 2 Chapter 16 – Technical Specifications

Robert Sharpe,
Advisory Engineer
AREVA NP
April 6, 2010

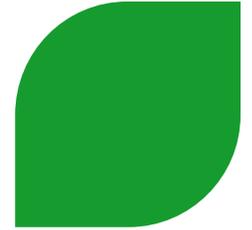


Development of U.S. EPR GTS



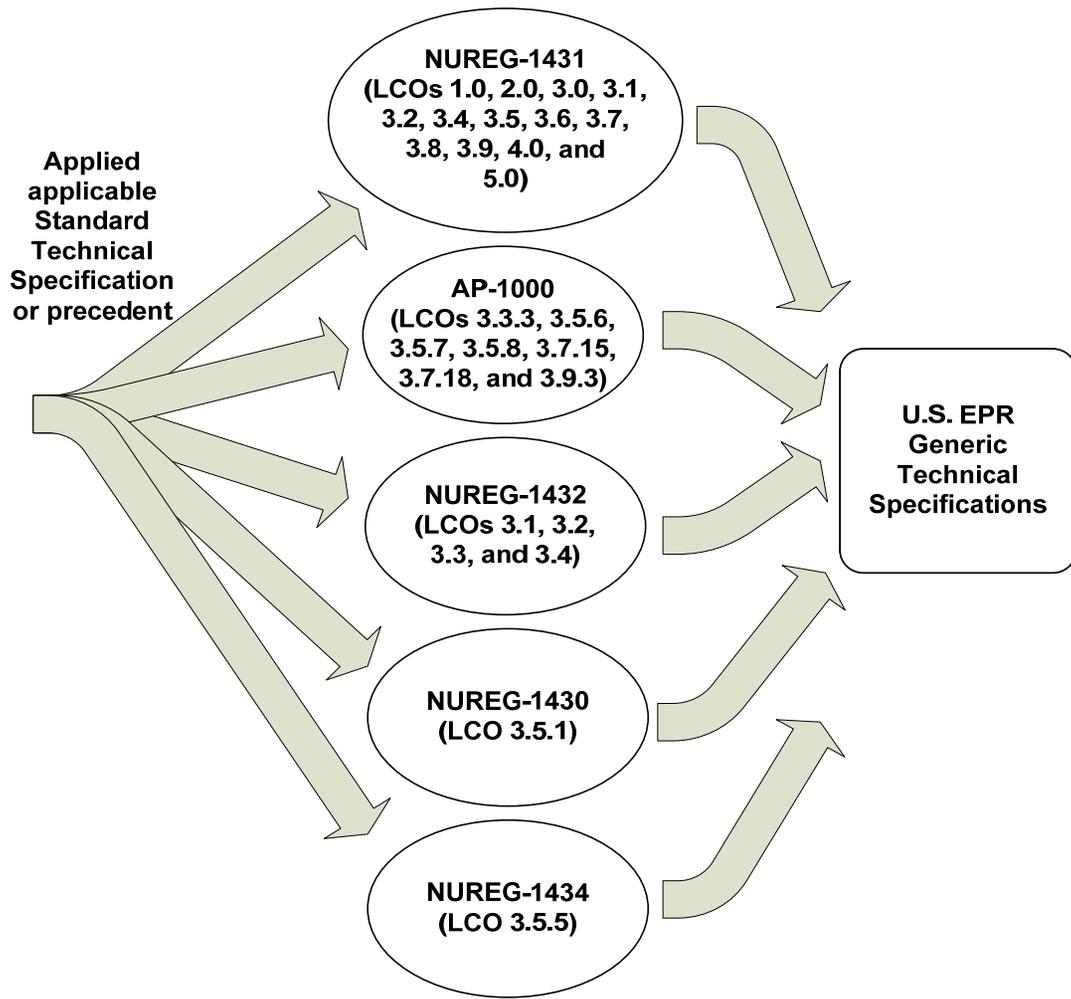
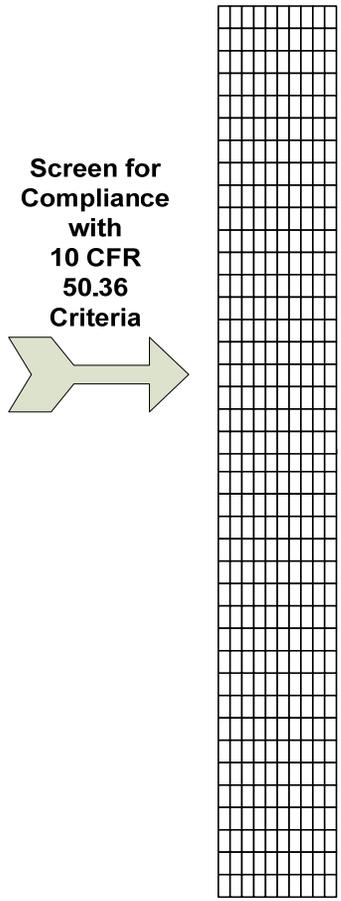
- ▶ **U.S. EPR Systems were reviewed for inclusion in the GTS**
 - ◆ Applied 10 CFR 50.36 (c) criteria
- ▶ **The U.S. EPR is an active, 4-loop PWR; therefore, Standard Technical Specifications (STS), NUREG 1431 Revision 3.1 was chosen as the primary model for the U.S. EPR GTS**
- ▶ **Also used other Improved STS NUREGs and precedents**
 - ◆ NUREG 1430 - Accumulator out of service time (NUREG 1431 time was risk based)
 - ◆ NUREG 1432 - Digital version of these specifications were a closer fit for some Sec 3.1, Reactivity Control and Sec 3.2, Power Distribution specifications
 - ◆ NUREG 1434 - BWR/6 Standby Liquid Control System was most appropriate model for Extra Borating System
 - ◆ AP1000 – Precedent for IRWST, Remote Shutdown, ECCS in shutdown Modes, and core decay time
- ▶ **Did not develop risk based specifications for the U.S. EPR GTS**
- ▶ **Accepted Completion Times and Frequencies from the STS were used**

Development of U.S. EPR GTS

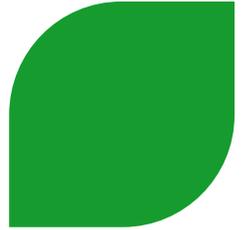


U.S. EPR Systems:

- ABVS
- AFWS
- AMI
- AMS
- AVS
- BCMS
- CAS
- CBVS
- CCWS
- CFS
- CGCS
- CMRS
- CRACS
- CRAVS
- CRDCS
- CREFS
- CTCS
- CVCS
- DGAIES
- DGCWS
- DGFOSTS
- DGLS
- DGSAS
- DSS
- DWDS
- EAC
- EBS
- ECCS
- EDS
- EFWS
- EPGBVS
- EPSS
- ERDS
- ESFAS
- ESWS
- FBVS
- ...



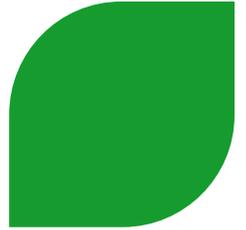
COL Supplied Information



- ▶ **Protection System Setpoints or Setpoint Control Program (Section 3.3.1)**
 - ◆ Confirmation of provided setpoints dependent on plant-specific instrument selection and detailed installation information
- ▶ **Site description (Section 4.1)**
 - ◆ Describe plant specific location
- ▶ **Single unit/Multiple unit Radiological Reports Option (Section 5.6.2)**
 - ◆ Allows option for multiple unit site to file single report
- ▶ **UHS makeup (Bases Section B3.7.19)**
 - ◆ Describe site specific interface details for UHS make-up source

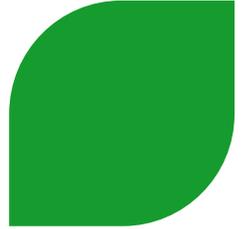
Chapter 16, Technical Specifications

Chapter Topics



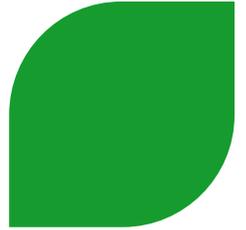
- ▶ **The U.S. GTS follow the format and content of the Improved Standard Technical Specification**
 - ◆ **1.0 Use and Application**
 - ◆ **2.0 Safety Limits**
 - ◆ **3.0 Limiting Condition for Operation and Surveillance Requirement Applicability**
 - ◆ **3.1 Reactivity Control**
 - ◆ **3.2 Power Distribution Limits**
 - ◆ **3.3 Instrumentation**
 - ◆ **3.4 Reactor Coolant System**
 - ◆ **3.5 Emergency Core Cooling System**
 - ◆ **3.6 Containment Systems**
 - ◆ **3.7 Plant Systems**
 - ◆ **3.8 Electrical Power Systems**
 - ◆ **3.9 Refueling Operations**
 - ◆ **4.0 Design Features**
 - ◆ **5.0 Administrative Controls**
 - ◆ **Bases**

Treatment of Trains



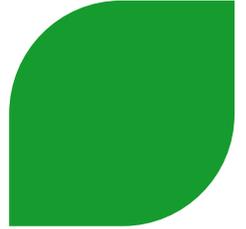
- ▶ **The four trains of safety systems is consistent with an “N+2” safety concept:**
 - ◆ **One train may be out for maintenance/surveillance**
 - ◆ **One train is assumed lost to single failure**
 - ◆ **One train may be lost to initiating event**
 - ◆ **One 100% capacity system is available for accident mitigation**

Use of TSTF Travelers



- ▶ **The NRC controls changes to the STS by coordination with the industry's Technical Specification Task Force (TSTF). The TSTF proposes generic changes to the approved NUREG STS for NRC review.**
- ▶ **A number of TSTF Travelers have been approved by the NRC since Revision 3.1 to the STS were approved.**
- ▶ **The TSTFs were evaluated for applicability to the U.S. EPR design and a number of these were incorporated into the U.S. EPR GTS**
- ▶ **Risk based TSTF Travelers were not incorporated in the U.S. EPR GTS**

Differences from STS NUREGs

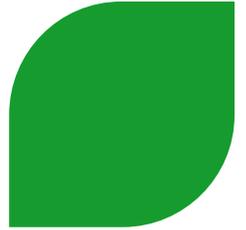


- ▶ **Differences reflect U.S. EPR specific design and supporting safety analysis**

- ▶ **Section 1.1, Definitions**
 - ◆ **Definitions related to instrumentation and controls and core parameters were replaced or revised from NUREG 1431 to reflect U.S. EPR design and terminology**

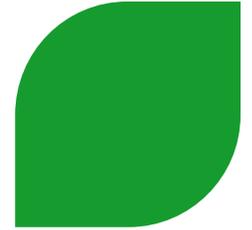
- ▶ **Section 2.0, Safety Limits**
 - ◆ **Revised Section 2.1 to reflect AREVA fuel and ECCS performance analysis methodologies**

Differences from STS NUREGs (cont.)



- ▶ **Section 3.1, Reactivity Control Systems and Section 3.2, Power Distribution Limits**
 - ◆ **NUREGs 1431 and 1432 STS used as models**
 - ◆ **Did not incorporate a part length control rod specification (U.S. EPR does not use part length control rods)**
 - ◆ **Revised to be applicable to AREVA nomenclature and fuel design**

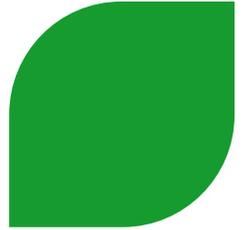
Differences from STS NUREGs (cont.)



▶ Section 3.3, Instrumentation

- ◆ **3.3.1, Protection System, U.S. EPR's digital protection system incorporates reactor trip and ESF functions credited in the safety analysis thereby reducing the number of subsections**
 - Does not reflect any STS or precedent
 - LCOs and Actions are component rather than function based
 - Necessary for operator implementation since single components may support several functions
 - Unique surveillance testing reflects system architecture, complies with regulatory guidance, and was previously reviewed when the generic platform was approved by the NRC.
- ◆ **3.3.3, Remote Shutdown Station, used AP1000 precedent to reflect computerized work station versus hard wired instruments and controls**

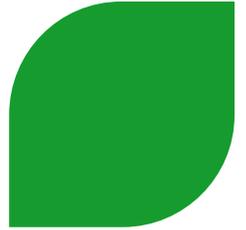
Differences from STS NUREGs (cont.)



▶ Section 3.4, Reactor Coolant System

- ◆ Revised to allow limited 3-loop operation (consistent with U.S. EPR safety analysis)
- ◆ Did not incorporate a PORV specification (function combined with PSRV)
- ◆ Did not incorporate a loop isolation valve and isolated loop specification (U.S. EPR does not have loop isolation valves)
- ◆ Did not incorporate a restriction on high head pumps as related to LTOP operation (Mis-operation of CVCS is not a limiting event)

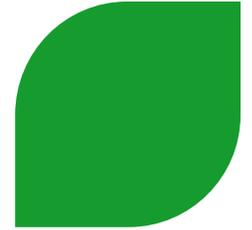
Differences from STS NUREGs (cont.)



▶ Section 3.5, Emergency Core Cooling Systems (ECCS)

- ◆ Revised to reflect four ECCS trains and the In-containment Refueling Water Storage Tank (IRWST)
- ◆ Added Extra Borating System (Two train boric acid injection modeled after BWR/6 specification)
- ◆ Added IRWST and ECCS specifications in Modes 5 and 6 to provide core cooling capability during reduced inventory operation
- ◆ Added requirements for use of enriched boric acid (U.S. EPR uses \geq 37% enriched boric acid)
- ◆ Did not incorporate a Seal Injection Flow specification (Seal injection is provided by CVCS which is non-safety and not credited)

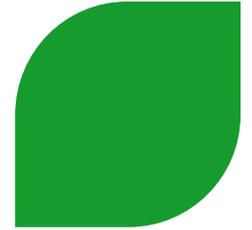
Differences from STS NUREGs (cont.)



▶ Section 3.6, Containment Systems

- ◆ **Did not incorporate a containment spray and cooling specifications (not credited in U.S. EPR analysis)**
 - Passive heat sinks (concrete walls and steel structures) inside containment are credited post-LOCA
 - Containment heat removal is performed by recirculation of reactor coolant from the IRWST, through the low-head safety injection heat exchangers, to the RCS, and through the postulated break back to the IRWST
 - Doses mitigated by Annulus Ventilation System
- ◆ **Eliminated bypass leakage – all penetrations terminate in filtered area**

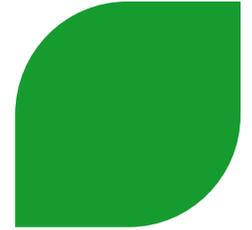
Differences from STS NUREGs (cont.)



▶ Section 3.7, Plant Systems

- ◆ **Revised specifications to reflect U.S. EPR design differences**
 - Revised LCOs and Actions to reflect four trains as appropriate
 - Fewer but larger main steam safety valves
 - U.S. EPR uses main steam relief trains
 - Replaces atmospheric dump valves
 - Used for depressurization
 - Each Emergency Feedwater train has a motor driven pump and a separate water storage pool with a normally isolated common header
 - Added specification for Safety Chilled Water System
- ◆ **Added specification for main steam line leakage (AP1000 specification used as a model) (U.S. EPR credits main steam line LBB)**

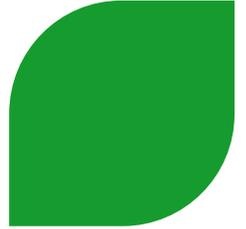
Differences from STS NUREGs (cont.)



▶ Section 3.8, Electrical Power Systems

- ◆ U.S. EPR utilizes four EDGs
- ◆ Alternate feeds can be established between Division 1 and 2 (one divisional pair) or Division 3 and 4 (another divisional pair)
- ◆ The alternate feed provides versatility in electrical alignments
- ◆ A single EDG can be inoperable for up to 120 days provided:
 - offsite circuits are operable,
 - no EDG common cause failure mode exists,
 - required redundant features are addressed, and
 - the associated alternate feed is established within 72 hours

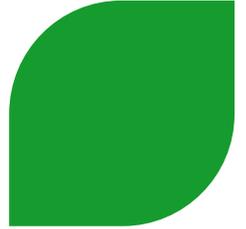
Differences from STS NUREGs (cont.)



▶ Section 3.9, Refueling Operations

- ◆ Did not incorporate an Unborated Water Source Isolation Valve specification since boron dilution is analyzed in Mode 6
- ◆ Replaced Containment Penetrations specification with specification for fuel decay time (Dose analysis demonstrates acceptable results)

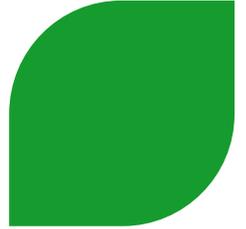
Differences from STS NUREGs (cont.)



▶ Section 5.0, Administrative Controls

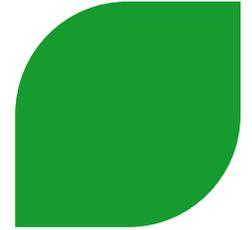
- ◆ Revised tendon surveillance program to reflect U.S. EPR design (use of grouted tendons)
- ◆ Revised Steam Generator Program per TSTF 449-A (specification consistent with current plants with Alloy 690 steam generator tubes)
- ◆ Added the Control Room Envelope Habitability Program per TSTF 448-A
- ◆ Replaced outdoor liquid storage tank discussion with a Reviewer's Note (outdoor liquid storage tank not part of standard U.S. EPR design)

Conclusions



- ▶ **U.S. EPR GTS were created to reflect:**
 - ◆ **Applicable regulatory requirements of 10CFR 50.36**
 - ◆ **The format, content, and usage rules of the Improved Standard Technical Specifications**
 - ◆ **The design of the U.S. EPR**

Chapter 16, Technical Specifications: Acronyms/Nomenclature



- ▶ **COL – Combined License**
- ▶ **CVCS – Chemical & Volume Control System**
- ▶ **ECCS – Emergency Core Cooling System**
- ▶ **EDG – Emergency Diesel Generator**
- ▶ **ESF – Engineered Safety Features**
- ▶ **GTS – Generic Technical Specifications**
- ▶ **IRWST – In-containment Refueling Water Storage Tank**
- ▶ **LBB – Leak Before Break**
- ▶ **LCO – Limiting Condition for Operation**
- ▶ **LTOP – Low Temperature Overpressure Protection**
- ▶ **PORV – Power Operated Relief Valve**
- ▶ **PSRV – Pressurizer Safety Relief Valve**
- ▶ **RCS – Reactor Coolant System**
- ▶ **STS – Standard Technical Specifications**
- ▶ **TSTF – Technical Specification Task Force**
- ▶ **UHS – Ultimate Heat Sink**





Presentation to the ACRS Subcommittee

AREVA EPR Design Certification Application Review

Safety Evaluation Report with Open Items

Chapter 16: Technical Specifications

April 06, 2010

Staff Review Team

- **Technical Staff**

- ◆ **Tech Reviewer Name: Hien Le**

- Branch Name: Technical Specifications

- ◆ **Tech Reviewer Name: Joseph DeMarshall**

- Branch Name: Technical Specifications

- ◆ **Tech Reviewer Name: Derek Scully**

- Branch Name: Technical Specifications

- **Project Managers**

- ◆ **Lead PM Name: Getachew Tesfaye**

- ◆ **Chapter PM Name: Peter Hearn**

Overview of DCA

SRP Section/Application Section		Number of RAI Questions	Number of SER Open Items
16.4.1	General	0	0
16.4.2	Use and Application	6	0
16.4.3	Safety Limits	3	0
16.4.4	Limiting Condition for Operation and Surveillance Requirement Applicability	2	0
16.4.5	Reactivity Control System	16	0
16.4.6	Power Distribution Limits	17	0
16.4.7	Instrumentation	108	11
16.4.8	Reactor Coolant System	22	9
Continued on next page			

Overview of DCA (Cont.)

SRP Section/Application Section		Number of RAI Questions	Number of SER Open Items
16.4.9	Emergency Core Cooling System (ECCS)	13	2
16.4.10	Containment Systems	15	1
16.4.11	Plant Systems	19	4
16.4.12	Electric Power Systems	57	2
16.4.13	Refueling Operations	7	0
16.4.14	Design Features	2	1
16.4.15	Administrative Controls	6	0
Totals		293	30

Description of Open Items

- RAI 300, Question 16-311 was issued as a follow-up RAI for the applicant to provide the additional information and update the RAI responses associated with Instrumentation TS open items in RAI set 103, based on the results of audits conducted with the staff on 7/30/09, 7/31/09, 8/13/09, and 8/14/09.
- RAI 103, Question 16-197 is being tracked as an open item to address the staff's concerns regarding omission of the PAM instrumentation Channel Check surveillance requirement from LCO 3.3.2.
- RAI 315, Question 16-320 was issued as a follow-up RAI for the applicant to provide the additional information necessary for the staff to conclude that GTS LCO 3.3.3, "Remote Shutdown Station," is implementable. The applicant proposes to no longer specify the required Remote Shutdown System functions in the GTS and Bases.
- RAI 110, Question 16-232 is being tracked as an open item to address technical and topical report references in Bases B 3.3.1, Protection System, whose versions or revisions have not been accepted or separately approved by the staff. These reports are being evaluated in Chapter 7 of the SER.

Description of Open Items

- RAI 293, Question 16-294 is being tracked as an open item. In the GTS 3.4.1 and its associated bases, the applicant needs to demonstrate that the specified RCS flow limit is bounding (e.g., the value in the COLR is at least equal to or more restrictive than the SG tube plugging limit assumed in the accident analyses) before the staff can determine the adequacy of LCO 3.4.1 requirements.
- RAI 293, Question 16-295 is being tracked as an open item. This open item involves a precautionary “Note” regarding low temperature overpressure protection before starting an idle reactor coolant pump in GTS 3.4.7.
- RAI 293, Question 16-296 is being tracked as an open item. This open item involves inconsistencies between the proposed changes to Condition A and the related discussions in the bases.
- RAI 293, Question 16-297 is being tracked as an open item. Editorial errors.
- RAI 293, Question 16-299 is being tracked as an open item. This open item involves the removal by the applicant of a discussion of the single-failure criterion applicable to the required number of PSRVs.

Description of Open Items

- RAI 293, Question 16-300 is being tracked as an open item. This open item involves the staff request to revise Condition F instead of Condition C to resolve the issue raised in the original RAI 101, Question 16-69.
- RAI 293, Question 16-301 is being tracked as an open item. This open item involves not incorporating the TSTF-449 model requirements into LCO 3.4.12d and TS 5.5.8.
- RAI 293, Question 16-302 is being tracked as an open item. This open item involves the limits for Dose Equivalent I-131 in the U.S. EPR design.
- RAI 293, Question 16-303 is being tracked as an open item. This open item involves the main steam safety valves set point tolerance for operability.
- RAI 293, Question 16-304 is being tracked as an open item. This open item involves the rated lift capacity assumed in the accident analyses for the MSSV inconsistent with ASME Code, Section III (NC-7512.1) requirements.
- RAI 293, Question 16-305 is being tracked as an open item. Editorial Errors.

Description of Open Items

- RAI 293, Question 16-306 is being tracked as an open item. This open item involves the explanation for not entering applicable LCOs for the supported systems when the safety chilled water system is inoperable.
- RAI 293, Question 16-307 is being tracked as an open item. This open item involves incomplete discussions in the Bases B 3.5.2 for Actions B.1, B.2 and C.1 for the ECCS.
- RAI 293, Question 16-308 is being tracked as an open item. Editorial errors.
- RAI 293, Question 16-309 is being tracked as an open item. This open item involves the applicant's addressing the conforming change to Condition D for the resilient seals for the Containment Purge valves.
- RAI 300, Question 16-310 is being tracked as an open item. This open item involves the assembly pitch provided in the GTS Paragraph 4.3.1.1.c not matching the values provided in the spent fuel pool criticality Topical Report.
- RAI 300, Question 16-312 was issued as a follow-up RAI for the applicant to provide the additional information and update the RAI responses associated with Instrumentation TS open items in RAI set 110, based on the results of audits conducted with the staff on 7/30/09, 7/31/09, 8/13/09, and 8/14/09.

Description of Open Items

- RAI 300, Question 16-313 was issued as a follow-up RAI for the applicant to provide the additional information and update the RAI responses associated with Electrical Power System TS open items in RAI set 74, based on the results of an audit conducted with the staff on 6/24/09.
- RAI 300, Question 16-314 was issued as a follow-up RAI for the applicant to resolve discrepancies in Bases B 3.8.1, AC Sources – Operating, regarding the total combined variation in EDG steady state output voltage and frequency permitted by National Electrical Manufacturers Association standard, NEMA MG 1-2006.
- RAI 300, Question 16-315 was issued as a follow-up RAI for the applicant to provide the additional information necessary to address interim staff guidance DC/COL-ISG-8, “Necessary Content of Plant-Specific Technical Specifications When a Combined License Is Issued,” with respect to Post Accident Monitoring variable selection criteria in Regulatory Guide 1.97, Revision 4.

Description of Open Items

- RAI 311, Question 16-316 is being tracked as an open item for the applicant to resolve discrepancies associated with setpoint value nomenclature in LCO Table 3.3.1-2, and FSAR Tables 15.0-7 and 15.0-8 .
- RAI 311, Question 16-317 is being tracked as an open item. This open item involves providing an assessment to confirm that all the LCO values in the proposed TS are consistent with the initial conditions assumed in the safety analyses.
- RAI 315, Question 16-318 was issued as a follow-up RAI for the applicant to provide the additional information necessary for the staff to conclude that exclusion of the following safety-related reactor trip initiation signals from the Generic TS is warranted: Manual Reactor Trip, Safety Injection System Actuation, and Emergency Feedwater System (EFWS) Actuation.
- RAI 315, Question 16-319 was issued as a follow-up RAI for the applicant to provide the additional information necessary for the staff to conclude that exclusion of the EFWS Isolation on High Steam Generator Level function from the Generic TS is warranted.

Description of Open Items

- RAI 110, Question 16-230, is being tracked as an open item to determine if adequate provisions exist to periodically test the continuous self-monitoring functions and automatic test features, and how the execution of automatic tests are confirmed during plant operation. The Continuous self-testing and online diagnostic monitoring capabilities, including the means to confirm that these features remain functional, are being evaluated in Chapter 7 of the SER.
- RAI 315, Question 16-321 was issued as a follow-up RAI for the applicant to provide the additional information necessary to resolve the staff's concerns regarding the ability of plant operations personnel to effectively implement manual protective actions in all cases.

Overview of Technical Presentation

- Applicable Regulations and Review Guidance
- TS Review Criteria
- RAI Status Summary
- Significant Open Issues

Applicable Regulations and Review Guidance

- 10 CFR 50.36 and 50.36a
- 10 CFR 52.47(a)(11)
- Primary SRP Section: 16.0, Rev. 3

Technical Specifications Review Criteria

- Meet requirements of 10 CFR 50.36 regarding SLs, LSSS, LCOs, SRs, Design Features, and Administrative Controls
- Conform to STS conventions regarding format and usage rules
- Reflect EPR design and accident analyses

RAI Status Summary

- Total number of RAIs 293
- Number of Open Items 30
- Number of Confirmatory Items 15

Significant Open Issues

- 120-day completion time to restore train to operable status for condition of one out of four required trains inoperable due to maintenance
- Instrumentation Surveillance Requirements (SRs)
- Post Accident Monitoring (PAM) Instrumentation
- Remote Shutdown System (RSS)
- Omission of Manual Reactor Trip (RT) Function from Generic TS (GTS)

120-Day Completion Time for One Train Inoperable

- The 120-day completion time is proposed in TS LCO for six safety-related systems having four independent trains.
- Except for the Emergency Diesel Generator (EDG) system, the remaining three operable trains still satisfy the single failure criterion without further system equipment realignment.
- Under STS guidance, unlimited operation is allowed with capability to withstand a single failure.

120-Day Completion Time for One EDG Inoperable

- The alternate feed design feature serves as the basis for the 120-day Completion Time (CT) in LCO 3.8.1, AC Sources - Operating.
- The alternate feed alignment is:
 - ♦ Not a temporary modification (actual design feature).
 - ♦ Not the normal configuration.
 - ♦ Implemented only when in a TS Action Statement that is intended to be temporary in nature.
- In order to conclude that the 120-day CT is acceptable, the staff needs assurance that use of the alternate feed design feature to support maintenance activities rendering an EDG inoperable, will be infrequent.

120-Day Completion Time for One EDG Inoperable (cont'd)

- The staff requested that AREVA provide the following information:
 - ♦ A detailed list of maintenance activities that would result in an EDG being out of service for a period up to 120 days.
 - ♦ The approximate maintenance time associated with each activity.
 - ♦ The frequency of these maintenance activities.
 - ♦ The type of compensatory measures that would be in effect during the 120 days and what configuration control management would be in place for an additional EDG failure.

Instrumentation SRs

- The Protection System (PS) utilizes a “component-based” approach to surveillance testing rather than the “function-based” approach that has been the standard for nuclear power plants currently operating in the United States.
- The staff was unable to determine how surveillance testing specified solely at the component level, ensures that each safety function required by TS is adequately tested, including verification of Limiting Safety System Settings.

Instrumentation SRs (cont'd)

- The U.S. EPR Digital Protection System includes continuous self-monitoring and online diagnostics to verify proper functioning of digital systems and to ensure the integrity of the installed application and system software.
- FSAR credits these features as a means of
 - ♦ ensuring partial compliance with established SRs for reactor protection systems, and
 - ♦ justifying deletion of Channel Check and Actuation Logic Test surveillances.

Post Accident Monitoring (PAM) Instrumentation

- COL applicants that reference the U.S. EPR design certification must address Revision 4 of RG 1.97, “Criteria for Accident Monitoring Instrumentation for Nuclear Power Plants”
- PAM variable selection criteria in RG 1.97, Revision 4, depend on the prior development of plant-specific Emergency Operating Procedures (EOPs) and Abnormal Operating Procedures (AOPs), which are post-COL activities

PAM Instrumentation (cont'd)

- COL applicants must complete site-specific TS information in the plant-specific TS in accordance with DC/COL-ISG-8, “Necessary Content of Plant-Specific Technical Specifications When a Combined License Is Issued,” prior to COL issuance using one of three options:
 - ◆ Option 1 provides site-specific TS information (PAM function list derived from RG 1.97 guidance – cannot do before COL issuance).
 - ◆ Option 2 provides useable bounding information (i.e. development of a bounding list of PAM functions).
 - ◆ Option 3 relocates site-specific information to licensee-controlled document and establishes an administrative control TS that requires determining the information using an NRC-approved methodology and that controls changes to the information (PAM function list derived from RG 1.97 guidance).

PAM Instrumentation (cont'd)

- AREVA has proposed a useable bounding list of PAM functions (Option 2). COL applicants could incorporate the bounding list by reference.
- The staff is evaluating the proposed PAM function list to determine if the list is truly bounding.

Remote Shutdown System

- AREVA proposes to no longer specify the required Remote Shutdown System functions in the generic TS and associated bases, which is a deviation from the STS bases (NUREG 1431, Rev 3).

Remote Shutdown System (cont'd)

- Instead, AREVA proposes that the GTS bases state that the displays and controls at the “Remote Shutdown Station” are functionally the same as the displays and controls normally used by the operator to achieve and maintain safe shutdown from the MCR.
 - ♦ The proposed RSS TS and bases do not identify or provide an FSAR reference that lists the required RSS functions relied upon to achieve and maintain safe shutdown from outside the main control room.

Remote Shutdown System (cont'd)

- Unclear how to determine that the operability requirements of GTS LCO 3.3.3 (“The RSS Functions shall be OPERABLE.”) are met.
- Therefore, staff is unable to conclude that the GTS 3.3.3, “Remote Shutdown Station” is implementable.

Omission of Manual RT Function from GTS

- AREVA has omitted the Manual RT function from the GTS on the basis that:
 - ♦ The trip is not credited in the Chapter 15 accident analyses, and
 - ♦ The trip does not satisfy 10 CFR 50.36, Criterion 3 (an SSC that is part of the primary success path which functions or actuates to mitigate a DBA or transient that either assumes failure of or presents a challenge to the integrity of a fission product barrier).

Omission of Manual RT Function from GTS (cont'd)

- The staff questions omission of the Manual RT function from the GTS on the basis that the Steam Generator Tube Rupture Accident Analysis in Chapter 15 states:
 - ♦ “In three cases, RT by operator action and concurrent LOOP were postulated to take place at 30 minutes into the accident.”

Staff Findings

- The Staff conducted a review and evaluation of the U.S. EPR FSAR, which generated in 293 Questions with 30 remaining as Open Items. Through the use of public meetings, audits and conference calls the open items have been defined and the staff and AREVA have arrived at a common understanding of the requirements that must be satisfied. Presently the staff concludes that resolution of the 30 open items is manageable within the planned schedule. Upon resolving the open items, the Chapter 16 U.S. EPR FSAR will provide sufficient information to assist the COL applicant in constructing a U.S. EPR that satisfies the requirements of 10 CFR Part 52.