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Plant License Renewal Subcommittee

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

February 8, 2006

The contents of this transcript of the proceeding of the United States Nuclear Regulatory Commission Advisory Committee on Reactor Safeguards, taken on February 8, 2006, as reported herein, is a record of the discussions recorded at the meeting held on the above date.

This transcript has not been reviewed, corrected and edited and it may contain inaccuracies.

1 UNITED STATES OF AMERICA
2 NUCLEAR REGULATORY COMMISSION

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4 ADVISORY COMMITTEE ON REACTOR SAFEGUARDS (ACRS)
5 PLANT LICENSE RENEWAL SUBCOMMITTEE MEETING

6 + + + + +

7 WEDNESDAY,

8 FEBRUARY 8, 2006

9 + + + + +

10 The meeting was convened in Room T-2B3 of
11 Two White Flint North, 11545 Rockville Pike,
12 Rockville, Maryland, at 1:30 p.m., JOHN D. SIEBER,
13 Chair, presiding.

14 ACRS MEMBERS PRESENT:

15 JOHN D. SIEBER, Chair

16 MARIO V. BONACA

17 OTTO L. MAYNARD

18 WILLIAM J. SHACK

19 GRAHAM B. WALLIS

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21
22
23
24
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1 ACRS STAFF PRESENT:

2 JOHN G. LAMB ACRS Staff Engineer

3 NRR STAFF PRESENT:

4 HANS ASHER

5 GREG CRANSTON

6 FRANK GILLESPIE

7 MAURICE HEATH

8 CAUDLE JULIAN

9 P.T. KUO

10 JIM MEDOFF

11 SIKHINDRA MITRA

12 BILL ROGERS

13 JAKE ZIMMERMAN

14 PROGRESS ENERGY STAFF PRESENT:

15 LENNY BELLER

16 TIMOTHY CLEARY

17 MARK GRANTHAM

18 MICHAEL HEATH

19 JEFF LANE

20 CHRIS MALLNER

21 GARRY MILLER

22

23

24

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I-N-D-E-X

<u>AGENDA ITEM</u>	<u>PAGE</u>
Opening Remarks	4
Staff Introduction	6
Brunswick License Renewal Application	8
A. Application Background	30
B. Description of Brunswick	9
C. Operating History	27
D. Scoping Discussion	31
E. Application of GALL	33
F. Commitment Process	43
SER Overview	51
A. Scoping and Screening Results	56
B. Onsite Inspection Results	65
Aging Management Program Review and Audits	72
Time-Limited Aging Analyses	85
Subcommittee Discussion	110

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

(1:31 p.m.)

OPENING REMARKS

CHAIRMAN SIEBER: This meeting will now come to order. This is a meeting of the Plant License Renewal Subcommittee. My name is John Sieber, Chairman of the Plant License Renewal Subcommittee.

The ACRS members in attendance are Dr. Graham Wallis and Dr. William Shack, Dr. Mario Bonaca. To my right is John Lamb of the ACRS staff, who is the designated federal official for this meeting.

Would you introduce yourself, please?

MEMBER MAYNARD: I'm the newest member of the ACRS. I'm Otto Maynard.

CHAIRMAN SIEBER: Thank you.

The purpose of this meeting is to discuss the license renewal application for the Brunswick steam electric plant, units I and II. We will hear presentations from the representatives of the Office of Nuclear Reactor Regulation, the region II office, and Carolina Power and Light Company.

The subcommittee will gather information, analyze relevant issues and facts, and formulate a proposed position and action as appropriate for deliberation by the full committee during its meeting

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1 this week.

2 The rules for participation in today's
3 meeting were announced as part of the notice of this
4 meeting previously published in the Federal Register
5 on January 25th, 2006. We have received no written
6 comments or requests for time to make oral statements
7 from members of the public regarding today's meeting.

8 A transcript of the meeting is being kept
9 and will be made available, as stated in the Federal
10 Register notice. Therefore, we request that
11 participants in this meeting use the microphones
12 located throughout the meeting room when addressing
13 the Subcommittee. Participants should first identify
14 themselves and speak with sufficient clarity and
15 volume so that they may be readily heard.

16 I would also ask that, particularly if you
17 make a statement or answer a question, that you make
18 sure that you signed in on the logs in back of this
19 post here so that the transcribing stenographer knows
20 who you are and what your name is so that the
21 transcript may be accurate and complete.

22 We will now proceed with the meeting. And
23 I call upon Mr. P. T. Kuo of the Office of Nuclear
24 Reactor Regulation to begin.

25 MR. KUO: Thank you, Mr. Chairman.

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STAFF INTRODUCTION

MR. KUO: This is P. T. Kuo, the Deputy Director of the Division of License Renewal. To my right is Mr. Jake Zimmerman. He's the Branch Chief for the License Renewal B Branch. And to my far right is Mr. S. K. Mitra. He's the project manager for this project for the staff review.

S. K. will be making the briefing for the staff on the SER that we prepared. And Jake is going to run the meeting today. We also have our inspection team leader, Caudle Julian, from region II. He's here to make a briefing to the staff on the inspection results.

We also have all of the technical support staff sitting here in the audience. They will be ready to answer any of the questions you might have.

So, with that, I will pass it to Jake.

MR. ZIMMERMAN: Good afternoon. Again, my name is Jake Zimmerman. I am the Branch Chief for Branch B. That is the projects branch.

One additional person I would like to also recognize is Dr. Ken Chang is here with us today. Dr. Chang is now the Branch Chief for Branch C, which is the Aging Management Audit Branch. That was the branch that I used to have. Dr. Chang took over for

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1 me in January, and I moved over to Branch B.

2 Louise Lund, who could not be with us
3 today, is the other branch chief for the project side.
4 She has License Renewal Branch A.

5 Just so you all know the way we're
6 structured now, branch A will be all of the projects
7 for the applications that are under review. Branch B,
8 my branch, will have application reviews but also
9 infrastructure review. The GALL update, all the
10 license renewal documents that were recently updated,
11 infrastructure work will now fall under me. And Dr.
12 Chang will have the audit activities.

13 With that, I will turn it back over to
14 you, Chairman Sieber.

15 CHAIRMAN SIEBER: Do you want to introduce
16 the applicant?

17 MR. KUO: Yes. Now we want to turn the
18 presentation to the applicant. This is Brunswick.
19 Please take it over.

20 MR. MIKE HEATH: Thank you.

21 BRUNSWICK LICENSE RENEWAL APPLICATION

22 MR. MIKE HEATH: My name is Mike Heath.
23 And I am the license renewal supervisor for the
24 Brunswick plant. With me up here today I have Lenny
25 Beller, who is the Brunswick licensing supervisor;

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1 Mark Grantham, who is the design engineering
2 superintendent at Brunswick.

3 With us from the plant, we also have Tim
4 Cleary, who is the Director of Site Operations. From
5 the license renewal organization, we have Joe Donahue,
6 who is the Vice President of Nuclear Engineering;
7 Garry Miller, who is the Manager of License Renewal.
8 And from the Brunswick license renewal staff, we have
9 Chris Mallner, Jeff Lane, Mike Fletcher, and Ed
10 Williams.

11 We want to give you a little bit of
12 background on the Brunswick plant today, talk about
13 how we developed our application. To do that, we will
14 start off with a description of the Brunswick plant,
15 give you an operating history, talk about our current
16 plant status. Those three items will be handled by
17 Mr. Beller.

18 Then we will be discussing our application
19 background, get into our review methodology, discuss
20 how we apply GALL, and then have some discussion on
21 our commitment process.

22 So, with that, I will turn that over to
23 Mr. Beller.

24 B. DESCRIPTION OF BRUNSWICK

25 MR. BELLER: Good afternoon. As Mr. Heath

1 said, my name is Lenny Beller. I am supervisor of
2 licensing at Brunswick.

3 Brunswick is a dual-unit GE BWR 4 with a
4 Mark I containment. We are located in Southport,
5 North Carolina on the Cape Fear River. The Cape Fear
6 River is our ultimate heat sink.

7 MEMBER WALLIS: It's a year-round river?
8 There are no fluctuations of any significance in the
9 flow?

10 MR. BELLER: That's correct, sir. We are
11 a 218-inch vessel. So we're one of the smaller BWR-4s
12 with 560 fuel assemblies per unit. And we are a
13 hydrogen water chemistry plant.

14 MEMBER SHACK: Now, do you use noble
15 metal, too?

16 MR. BELLER: No, sir, hydrogen water
17 chemistry only.

18 MEMBER SHACK: Now, your license renewal
19 application doesn't commit you to use hydrogen water
20 chemistry, as I understand it, right?

21 MR. MIKE HEATH: No, sir. We are not
22 using hydrogen water chemistry as a commitment.

23 MEMBER SHACK: As a commitment.

24 MR. MIKE HEATH: We are a hydrogen water
25 chemistry plant.

1 MR. BELLER: At this time we were asked
2 some questions prior to the meeting regarding our
3 primary containment and recirc piping. And I would
4 like to turn it over to Mr. Grantham.

5 MR. GRANTHAM: Good afternoon. This is
6 Mark Grantham again. I am the superintendent of
7 design engineering.

8 Brunswick has a unique Mark I containment.
9 We are the only Mark I containment that actually has
10 the suppression-pool torus encapsulated in concrete.
11 The other sites have a freestanding torus that is
12 supported.

13 MEMBER WALLIS: Now, that torus is pretty
14 big. The thickness of that concrete in places is
15 quite remarkable, isn't it?

16 MR. GRANTHAM: That is correct. It's on
17 the order of three to four feet thick.

18 MEMBER WALLIS: Or even more in the
19 corners.

20 MR. GRANTHAM: Correct.

21 MEMBER WALLIS: Minimum is three to four
22 feet.

23 MR. GRANTHAM: Correct.

24 CHAIRMAN SIEBER: Now, the metallic part
25 of the torus acts as a liner, as opposed to a

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1 structural member. Is that correct?

2 MR. GRANTHAM: That is correct. There is
3 a liner on the inside of the concrete that --

4 CHAIRMAN SIEBER: Right.

5 MR. GRANTHAM: -- provides a --

6 CHAIRMAN SIEBER: And the concrete itself
7 is the structural member?

8 MR. GRANTHAM: That's correct.

9 CHAIRMAN SIEBER: Okay.

10 MR. GRANTHAM: Any other questions
11 regarding specifically the Mark I containment?

12 MEMBER BONACA: Given the unique
13 configuration, I mean, how did you address the issue
14 of leakage from seals, the refueling seals?

15 MR. GRANTHAM: From refueling seals?
16 Well, we have observed no leakage from the refueling
17 seal. Again, there is a barrier of concrete that goes
18 directly against the containment liner.

19 MEMBER BONACA: That's why I was asking
20 the question. It's a unique configuration there.

21 MR. GRANTHAM: We have in the past
22 observed some corrosion between the concrete and
23 liner. That primarily occurred due to issues during
24 construction where construction debris was left in
25 place between the liner and the concrete at the

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1 personal access hatch. There is actually a felt
2 coating between the liner in the concrete that during
3 construction became wet and when the concrete was
4 poured served as a mechanism to allow corrosion.

5 MEMBER BONACA: Okay.

6 MR. GRANTHAM: Due to the construction
7 with the liner and the concrete, whenever that
8 corrosion occurs, just the expansion of the corrosion
9 products provides bulging.

10 So our IWE program specifically looks for
11 bulging on the containment liner as a method for
12 identification of any type of corrosion between the
13 actual liner and --

14 MEMBER WALLIS: How much bulging can you
15 detect?

16 MR. GRANTHAM: We actually go out with
17 straightedges. It is fairly visible.

18 MEMBER WALLIS: So you can detect what, an
19 eighth of an inch or something or less than that?

20 MR. GRANTHAM: Yes, eighth of an inch.

21 MEMBER WALLIS: Would that mean there is
22 an eighth of an inch corrosion behind it or more?

23 MR. GRANTHAM: Well, when you have
24 corrosion, the corrosion product expands quite a bit
25 more than the actual metal loss. So it does not take

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1 a lot of metal loss to start the --

2 MEMBER SHACK: Do you have a quantitative
3 feel for how much metal loss you can have before you
4 detect it from experience?

5 MR. GRANTHAM: No. Based on our
6 experience, particularly a couple of outages ago, we
7 had a bulging in the personnel access hatch. We did
8 not encroach it on min wall when we went in. We went
9 in and did UTs. Now, we did go in and do the other --

10 MEMBER SHACK: Oh, that's what you do?
11 You come in and you do a UT from the back --

12 MR. GRANTHAM: Correct.

13 MEMBER SHACK: -- to find out how much is
14 left?

15 MR. GRANTHAM: That is correct. And that
16 is fairly standard if we find bulging to go in and do
17 UTs so we know exactly what level of metal we have
18 there.

19 MEMBER SHACK: Now, do you do inspections
20 of the linear in the torus, too?

21 MR. GRANTHAM: That is correct. In the
22 error region, that is part of the IWE program. We do
23 go in and do inspections of that region.

24 MEMBER BONACA: So essentially from your
25 configuration, you don't feel that you have the

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1 concern regarding leakage from the fueling seal?

2 MR. GRANTHAM: No, sir, we do not.

3 MEMBER BONACA: And that is something that
4 the staff has accepted, too?

5 CHAIRMAN SIEBER: On the other hand, large
6 concrete structures like this, another example would
7 be a large dry PWR-type containment. When you
8 construct that, the concrete cracks. And so there is
9 a pathway for ingress of oxygen to the inside of the
10 liner. And your liner is carved in steel, right?

11 MR. GRANTHAM: That is correct.

12 CHAIRMAN SIEBER: So you have an
13 opportunity for moisture. At least from the outside
14 in, you have an opportunity to get oxygen in there on
15 carbon steel. So it's a natural place for corrosion
16 to occur.

17 Do you do any kind of volumetric
18 examination of the liner? And if so, how do you do
19 it?

20 MR. GRANTHAM: No volumetric other than,
21 well, we do UTs for thickness measurement, no other
22 volumetric --

23 MEMBER WALLIS: How thick is the liner?

24 MR. GRANTHAM: The drywell liner is
25 five-sixteenths-inch thick.

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1 MEMBER WALLIS: Now, at half an inch or --

2 MR. GRANTHAM: Suppression pool liner is
3 three-eighths of an inch. I will say the areas where
4 we have found degradation, we actually cut out a
5 portion of the liner and found the corrosion products
6 on the back side were, in fact, dry. And there was no
7 active corrosion that was going on there.

8 MEMBER WALLIS: So do you have a way of
9 predicting from any in-service examination that you
10 perform how much material you have left that can
11 corrode before you lose integrity of the torus or any
12 part of containment? Do you have a way to do that or
13 does your ISI program say it's good today and it was
14 good yesterday, but I don't know about tomorrow?

15 MR. GRANTHAM: Well, we do frequent
16 inspections. And, again, we do do ultrasonic
17 thickness measurements. We do have a minimum
18 thickness.

19 MEMBER WALLIS: Okay. That's sort of a
20 volumetric technique.

21 MR. GRANTHAM: Correct.

22 MEMBER WALLIS: Sort of.

23 MR. BELLER: Plus, anything that we find
24 in one unit, we will obviously take that operating
25 experience and go look in the opposite unit to make

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1 sure that that failure mode is not present there as
2 well.

3 MEMBER WALLIS: Okay.

4 MEMBER BONACA: So, to summarize, what I
5 hear is that whatever corrosion you have is
6 historical, seems to be historical, --

7 MR. GRANTHAM: Correct.

8 MEMBER BONACA: -- came in from the
9 initial construction.

10 MR. GRANTHAM: That is correct.

11 MEMBER BONACA: And so I guess there
12 should be an objective of verification, I mean, as you
13 go forth, that you don't have any --

14 MR. GRANTHAM: That's correct. Our IWE
15 program is an ongoing program where we inspect
16 essentially 100 percent degree ISI interval.

17 MEMBER BONACA: Now, should you have
18 leakage from those seals -- and you said that you
19 don't, but should you have it, in that configuration,
20 you have no way for it to penetrate between the
21 concrete and the metal?

22 MR. GRANTHAM: I believe that is the case.
23 We have seen no evidence of that.

24 CHAIRMAN SIEBER: So your aging management
25 program for containment consists of doing in the

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1 future what you are doing today?

2 MR. GRANTHAM: That is correct. It is
3 implementation of our section 11 IWE and IWL programs.

4 MEMBER MAYNARD: When you found corrosion
5 through the bulging, did you typically just do the UT
6 and then monitor that in the future or did you cut it
7 out and repair it?

8 MR. GRANTHAM: We did well repairs in some
9 instances. We had actually one area that had gone
10 through while in the containment liner, where it was
11 a wet glove from construction was left between the
12 liner and the concrete. That area actually went
13 through while we cut out that area and replaced it.
14 That is correct. But where we have found them, where
15 they encroach on --

16 MEMBER BONACA: What do you mean "went
17 through," I mean, like the roof?

18 MR. GRANTHAM: Through the liner. That's
19 correct.

20 CHAIRMAN SIEBER: Yes. So at that point,
21 you did not have containment integrity?

22 MR. GRANTHAM: We did do a test of the
23 through-walled area, a localized test up to
24 containment pressure, accident pressure. It did, in
25 fact, pass. That is correct.

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1 MEMBER BONACA: So you provided that.

2 CHAIRMAN SIEBER: Well --

3 MEMBER WALLIS: This is just a wet glove?

4 MR. GRANTHAM: That is correct. The
5 design of this is there are Nelson studs welded to the
6 liner that go into the concrete. It appeared that a
7 glove was dropped during construction. And that
8 landed on one of the Nelson studs before the concrete
9 was actually poured.

10 MEMBER WALLIS: There is still a pretty
11 rapid corrosion rate replacing carbon steel. The
12 oxygen has got to get there from somewhere. The glove
13 doesn't provide the oxygen.

14 CHAIRMAN SIEBER: Well, this is an inertic
15 containment, right?

16 MR. GRANTHAM: That is correct.

17 MEMBER WALLIS: That's from the outside.

18 CHAIRMAN SIEBER: But the oxygen can
19 attack --

20 MEMBER WALLIS: From the outside.

21 CHAIRMAN SIEBER: -- from the outside.

22 MEMBER WALLIS: Right. But there are
23 plenty of trucks driving around with chassis that are
24 not as thick as that that didn't corrode away.
25 They're subject to the elements. So this just seems

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1 a rapid corrosion rate to me.

2 CHAIRMAN SIEBER: Well, there aren't very
3 many 60-year-old trucks driving around.

4 MEMBER WALLIS: There are some pretty old
5 trucks.

6 CHAIRMAN SIEBER: Okay.

7 MEMBER WALLIS: Well, it just seems a bit
8 surprising you've got that much corrosion just from a
9 glove. At least you fixed it.

10 MR. GRANTHAM: Are there any other
11 questions on containment?

12 CHAIRMAN SIEBER: No, but I think it's an
13 area where I need to and perhaps my colleagues need to
14 ponder that because it is a complex design. It's not
15 particularly amenable to a volumetric inspection. And
16 since it's made out of carbon steel subject to
17 corrosion because all of the essential elements of
18 corrosion are present --

19 MEMBER BONACA: And the concern is that
20 you don't want to go through corrosion before you find
21 out.

22 CHAIRMAN SIEBER: Yes.

23 MEMBER BONACA: And so --

24 CHAIRMAN SIEBER: And this design, to my
25 understanding, is unique in the industry.

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1 MR. GRANTHAM: That is correct.

2 CHAIRMAN SIEBER: No other containment,
3 Mark 1 containment, built like this. And so you can't
4 draw on the experience of another plant particularly.

5 Okay. I think unless other members have
6 questions --

7 MR. GRANTHAM: Okay. There was one other
8 question about recirc piping replacement we're going
9 to cover as part of this.

10 CHAIRMAN SIEBER: All right. You can do
11 that.

12 MR. GRANTHAM: In the mid 1980s, we did
13 replace the recirc risers. We did have some IDCC that
14 went through. We had a number of welled overlays.
15 And we did replace those with the one-piece no-weld
16 construction riders.

17 CHAIRMAN SIEBER: Do you know what
18 material the replacement risers were made from?

19 MR. GRANTHAM: Do you remember, Chris?

20 MR. MALLNER: This is Chris Mallner.

21 I think those replacement risers were a
22 316 ng nuclear braid.

23 MEMBER SHACK: So your recirculation
24 headers, then, are still the original 304?

25 MR. GRANTHAM: That is correct.

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1 MEMBER SHACK: Do you have overlays on
2 them or IHSI, any kind of stress improvement, or it's
3 just the 304 header?

4 MR. GRANTHAM: Do you want to address
5 that?

6 MR. MALLNER: Again, this is Chris
7 Mallner.

8 Nothing specific was done, as far as I can
9 recall, with the headers. It was just basically riser
10 replacements. I think they did some mechanical stress
11 improvement, did some IHSI for the risers and around
12 the nozzles.

13 MEMBER SHACK: Okay. So you still have
14 augmented inspection, then, in the headers? You don't
15 have two means of mitigation on the header welds from
16 an 031 point of view?

17 MR. MALLNER: We still do the augmented
18 inspections.

19 Again, Chris Mallner.

20 MEMBER SHACK: We might as well bring up
21 the core shroud while we're here. The core shroud
22 says it's stainless steel. Is it ordinary
23 garden-variety stainless steel, 304, 316?

24 MR. GRANTHAM: It's 304 stainless steel.

25 MEMBER SHACK: So you don't need a

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1 high-strength material to provide this integrity?
2 It's not precipitation-hardened? I mean, it's 304.

3 MR. GRANTHAM: It's just straight 304
4 stainless steel.

5 MEMBER SHACK: Do you know what the stress
6 load is on that? I mean, you're pushing this up near
7 yield. Is it within an ASME kind of code stress
8 limit?

9 MR. GRANTHAM: Chris, do you know?

10 MR. MALLNER: Garry Miller may want to
11 address that.

12 MR. MILLER: My name is Garry Miller. I
13 am the Manager of License Renewal. I was project
14 manager when the shroud indications were diagnosed
15 back in the early '90s.

16 Your question is were the loads across the
17 shroud when the --

18 MEMBER SHACK: No, no. Across the tie
19 rods.

20 MR. MILLER: Across the tie rods. Well,
21 at low power, the actual weight of the structure above
22 it is actually forcing down on that, the actual seam
23 that actually had the majority of the indications in
24 that the clamps go across.

25 As power is raised and steam pressure is

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1 raised inside the shroud, there becomes an upward
2 force on it. So it changes during operation.

3 MEMBER SHACK: No. But there is a
4 pre-load on those rods, which takes it to --

5 MR. MILLER: But we don't have rods. What
6 we have got is one joint that, actually, there was a
7 clamp across it where we EDMed holes through the
8 shroud above and below that weld location and actually
9 have bolted clamps across it and have changed. In
10 essence, we have replaced that weld joint with a
11 mechanical clamp across it, mechanical joint.

12 MEMBER SHACK: Oh, this is not one of
13 these tie rod joints?

14 MR. MILLER: We were the first. And the
15 design we have was one of a kind that preceded the
16 rest of the tie rod designs.

17 MR. MEDOFF: This is Jim Medoff of the
18 staff.

19 I asked an RAI to confirm that they did
20 not replace the original clamps with tie rods and
21 change their design. They confirmed that they still
22 are using the C clamps and the repair design.

23 MEMBER SHACK: Okay. So this C clamp is
24 bolted above and below the weld.

25 MR. MEDOFF: The C clamp should cover the

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1 H-1 to 2 and 3 welds.

2 MEMBER SHACK: Welds.

3 MR. MEDOFF: That's correct.

4 MEMBER SHACK: Why?

5 MEMBER WALLIS: To react to a design by a
6 carpenter.

7 MEMBER BONACA: I just have a question I
8 want to ask just for information here. You know, we
9 talk about the shroud and the problems you have with
10 the shroud. That's operating experience.

11 When I was reading the application chapter
12 3, you know, under mechanical descriptions of the six
13 individual groupings of passive components, for each
14 one of them, for example, the reactor vessel and
15 reactor coolant systems, you provide operating
16 experience, a summary of it. And there I found a
17 description of the steam dryer cracking that you had
18 experienced or has been experienced actually be a
19 sister plant, I mean, and the erosion components, but
20 specifically you talk about flow orifices and pump
21 casings in the CRD system.

22 There is no mention there of any other
23 operating experience. Yet, throughout the
24 application, I found a lot of examples, including the
25 shroud, for example. That tells me that there is

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1 additional operating experience.

2 What am I missing there? You use words
3 like as "This is the operating experience. No other
4 unpredicted aging effects were found." What does it
5 mean?

6 MR. GRANTHAM: Chris, do you want to take
7 that?

8 MR. MALLNER: I'll take it. Again, this
9 is Chris Mallner.

10 We do our operating experience review in
11 order to determine whether or not there is a
12 possibility that there is an aging effect that could
13 be happening at our plants that our normal aging using
14 our aging tools would not predict.

15 So if we review the operating experience
16 and we find that the operating experience would have
17 been predicted by the tools we're using in order to
18 predict aging effects, we say that those things are
19 the same.

20 MEMBER SHACK: So that's what we mean --

21 MR. MALLNER: What we're looking for in
22 our operating experience is those things that would be
23 outside the bounds of our aging tool and would only be
24 predicted by operating experience.

25 MEMBER BONACA: So you really did not

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1 experience, for example, erosion of components such as
2 pump casings and CRDs?

3 MR. MALLNER: That's correct. That was a
4 --

5 MEMBER BONACA: Sister plant. Okay.

6 MR. MALLNER: This is Chris Mallner again.

7 No. That was a plant-specific thing. We
8 had gone in there and noticed there was some erosion
9 of a pump casing. They did a nickel-based alloy
10 overlay. We identified that from operating
11 experience. And we applied a one-time inspection
12 program to validate the efficacy of the repair.

13 MEMBER BONACA: Okay. Fair enough. Okay.
14 I understand now.

15 MR. MIKE HEATH: We'll then return to
16 operating history with Mr. Beller.

17 CHAIRMAN SIEBER: Okay.

18 C. OPERATING HISTORY

19 MR. BELLER: This is Lenny Beller.

20 Going back to operating history, unit 2
21 actually was licensed and began commercial operation
22 first. Commercial operation on unit 2 began in
23 November of 1995. And unit 1 followed in March of
24 1997. Current license expiration is September --

25 CHAIRMAN SIEBER: '77 and '75.

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1 MR. BELLER: Thank you very much. '75 and
2 '77. Current license expiration for unit 1 is
3 September 2016 and unit 2 in December 2014.

4 Our operating license thermal power has
5 changed over time. We were originally licensed to
6 2436 megawatts thermal. In the mid '90s, we had to
7 take a stretch uprate of 5 percent to 105 percent of
8 original licensed thermal power.

9 We were licensed. We received our license
10 for that in November of 1996. It was a pressure
11 increase power uprate. So we implemented it in the
12 subsequent refueling outages. So we can do the plant
13 modifications that would support that.

14 In May of 2002, we received a license for
15 an extended power uprate. In our operating history
16 there, after receiving the license, since it was a
17 constant power uprate, we could proceed with
18 increasing power through our start-up test program.

19 Unit 1 increased power to 113 percent of
20 original rated in June of 2002 and then went to 120
21 percent in April of 2004. So we're just now
22 completing our full first cycle, refuel cycle, at the
23 full 120 percent.

24 MEMBER WALLIS: Did anything happen that
25 was noteworthy after you went to high power?

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1 MR. BELLER: We have some operating
2 experience --

3 MEMBER WALLIS: The steam dryers worked
4 quite okay?

5 MR. BELLER: That's correct. And we have
6 a presentation that Mr. --

7 MEMBER WALLIS: Within the scope of
8 license renewal?

9 MR. BELLER: That's correct.

10 MR. MIKE HEATH: Steam dryers are in the
11 scope.

12 MEMBER WALLIS: Did you have to apply for
13 containment over-pressure credit?

14 MR. GRANTHAM: Yes, we did.

15 MEMBER WALLIS: You did?

16 MR. GRANTHAM: That's correct.

17 MR. MIKE HEATH: We were a safety guide 1
18 plant with a zero. And we did apply and receive
19 increased pressure.

20 MR. GRANTHAM: We were required 3.1 psig
21 of over-pressure. We got credit for 5 psig. And we
22 had --

23 MEMBER WALLIS: For quite a long time?

24 MR. GRANTHAM: Around 20-24 hours is what
25 sticks in my mind.

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1 MEMBER WALLIS: Around a day.

2 MR. GRANTHAM: Around a day.

3 MR. BELLER: Continuing on, unit 2
4 achieved 116 percent power in April of 2003 and 120
5 percent power in April of 2005. So we're coming up on
6 the first year of unit 2 on 120 percent power.

7 Current plant status, unit 1 is --

8 MEMBER WALLIS: Your dryers are different
9 design from Dresden and Quad Cities, are they?

10 MR. BELLER: Yes, that's correct.

11 MR. GRANTHAM: That's correct. We have
12 the BWR slant hood dryer that has roughly a quarter.
13 For a given load, it has around a quarter of the
14 stresses of what you would encounter in the square
15 dryer hood.

16 MR. BELLER: Unit 1 is currently in its
17 15th operational cycle. Both units did transition to
18 a 24-month cycle in 1997. Currently unit 1 is at 100
19 percent rated thermal power. And we are going to
20 enter a refuel outage on March 4th of this year.

21 Unit 2 is in operating cycle 17 and,
22 again, transition to a 24-month cycle in '97. Unit 2
23 is also at 100 percent power. We do have one plant
24 issue. We have a white performance indicator, NRC
25 performance indicator, for unplanned power changes.

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A. APPLICATION BACKGROUND

MR. MIKE HEATH: This is Mike Heath. I'll give you a little discussion, then, on our application background.

This application was submitted and prepared using the class of 2003 format. We used the 2001 versions of the standard review plan and GALL and the March 2001 version of NEI 95-10.

As we put this application together, we built the application essentially using plant calculations. The plant calculations are developed using plant procedures for calculation development. And we are fully compliant with our appendix B program at Brunswick.

D. SCOPING DISCUSSION

MR. MIKE HEATH: We did our scoping. We did scoping on a system basis, initially using the UFSAR or design basis documents, and our docketed correspondence. We then drill down to the component level using our quality clash review from our electronic database. That allowed us to scope right down to piece parts or two components for our systems.

We also did focus reviews for regulated --

MEMBER WALLIS: What I don't understand, I noticed that light bulbs are in scope. It doesn't

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1 refer to the shape of the drywell. But light bulbs
2 are in scope? I was amazed to see something like that
3 in the SER.

4 Light bulbs are a disposable item. Why
5 would they be in scope?

6 MR. MIKE HEATH: I'm not sure.

7 MEMBER WALLIS: Maybe it's the staff that
8 said this. So maybe I should ask them why light bulbs
9 are in scope. It just seemed very strange to me that
10 light bulbs --

11 MR. MIKE HEATH: I don't recall putting
12 any light bulbs in, but --

13 MEMBER WALLIS: Okay. Well, it's in the
14 SER, page --

15 MR. MIKE HEATH: If we had a
16 non-safety-related system, for instance, that had a
17 component that was mounted on the control board. And
18 we would have brought that system in for the function
19 of having that switch on the main control board. I
20 would have to check on the light bulbs, though.

21 We did focus reviews for our regulated
22 events and for the non-safety-impacting,
23 safety-intended function. A couple of things that
24 came into scope because of that were the
25 non-safety-related steam dryers, which is based on

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1 industry OE for uprated plants, and our
2 non-safety-related drain, which is based on
3 plant-specific OE associated with some drain failures
4 we had that impact the safety-related equipment.

5 MEMBER WALLIS: Does this also affect some
6 of the service water, which is relied upon to cool
7 things which are supposed to work during an accident
8 but are not safety-related?

9 There are some heat exchangers and things
10 that service water works on. Did you bring them into
11 scope? Was that an example of something brought into
12 scope because of a non-safety-related system affecting
13 performance of safety-related?

14 MR. MIKE HEATH: Did you catch the
15 question?

16 MEMBER WALLIS: Did any of the service
17 water get brought into scope because of its effect on
18 safety-related systems?

19 MR. LANE: This is Jeff Lane with Progress
20 Energy.

21 We brought in fluid-containing systems in
22 areas that had safety-related components. So to the
23 extent that non-safety-related service water pipe was
24 in a building that contained safety-related
25 components, it was --

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E. APPLICATION OF GALL

MR. MIKE HEATH: We addressed all of our ISGs 1 through 20. This application was submitted to the old GALL prior to the new GALL being approved.

Our aging management review, we used the 2003 table format. It's a nine-column table, which then allowed us to align our line items with GALL. We identified 34 aging management program. Of those, eight are new to the Brunswick plant. And five are considered plant-specific to Brunswick.

CHAIRMAN SIEBER: Before you leave this slide, you say steam dryers are in scope. And obviously you have had the equivalent of a 20 percent EPU. What has the performance of the steam dryers been under the increased power level? What examinations have you made to determine if there is cracking or an extension of preexisting cracking? What measurements have you taken for things such as vibration or unusual system responses that could indicate that there were problems occurring with your steam dryers?

MR. GRANTHAM: This is Mark Grantham again.

In the outage before we actually achieved our full 420 percent uprate, we did a full VT-1

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1 external inspection of our steam dryers. That was in
2 accordance with GE SIL 644, rev 1, which provide the
3 inspection criteria as well as BWR VIP 139.

4 CHAIRMAN SIEBER: VT-1 is a standard
5 visual, as opposed to an enhanced visual?

6 MR. GRANTHAM: That is correct. We did
7 find some minor cracking existing that was typically
8 IGSCC-type cracking, small.

9 CHAIRMAN SIEBER: Where?

10 MR. GRANTHAM: Six to eight-inch range.
11 We did do some modifications to the dryer based on the
12 recommendations of General Electric. That included
13 increasing the weld size on our cover plate. We have
14 a three-eighths-inch cover plate that had a
15 quarter-inch weld.

16 The dryers that failed after uprate, the
17 square hood dryers, had a thin, one-quarter-inch,
18 cover plate. We beefed up the welds on our cover
19 plate so that they would be three-eighths-inch. We
20 also added a center gusset to provide stiffening to
21 the outer hoods. We also increased the size of the
22 tie bars on the top of the dryer. Again, those
23 modifications were performed in March of 2004.

24 In April of last year -- this is one year
25 of operating at the full 120 percent power -- we came

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1 down for a mid-cycle fuel bundle replacement outage to
2 do a leaking fuel bundle.

3 At that time, we went in and did a VT-1
4 inspection of the dryer repairs as well as the
5 indications that we had identified in the VT-1
6 inspection during the previous outage and found no
7 further degradation. So after one year operating
8 cycle at 120 percent, we didn't see any further
9 degradation.

10 Now, we do plan to repeat those
11 inspections. It will be, again, a full VT-1. It will
12 be external during our refueling outage, which starts
13 in March.

14 CHAIRMAN SIEBER: Do you have any
15 instrumentation installed that would tell you if you
16 had unusual or excessive vibrations coming from the
17 steam dryer?

18 MR. GRANTHAM: No, we do not. As a point
19 of reference, dryer loading is heavily influenced by
20 steam line velocity. Steam line velocity is a major
21 indication --

22 CHAIRMAN SIEBER: Obviously the diameter
23 of the steam line.

24 MR. GRANTHAM: The Brunswick steam line
25 velocity after power uprate was 146 feet per second.

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1 CHAIRMAN SIEBER: Okay.

2 MR. GRANTHAM: As a relative value, the
3 dryers that failed, the square hood dryers, those
4 steam line velocities, were well in excess of 200 feet
5 per second.

6 CHAIRMAN SIEBER: What's the diameter of
7 your steam line?

8 MR. GRANTHAM: Twenty-four-inch?

9 MR. BELLER: Twenty-four-inch.

10 CHAIRMAN SIEBER: And you had four?

11 MR. BELLER: That's correct.

12 MR. GRANTHAM: That correct. But the key
13 point is, even after uprate, our steam line velocities
14 were still well in the middle of the BWR fleet. For
15 example, our steam line velocities after uprate were
16 well below the steam line velocities of the failed
17 dryers before they uprated.

18 So from a vibration standpoint, given the
19 velocities we have, we don't believe that's an issue.
20 And, again, we have not instrumented those dryers.

21 CHAIRMAN SIEBER: And you have no
22 instrumentation to tell you whether it's happening or
23 not?

24 MR. GRANTHAM: That is correct. We are
25 doing the monitoring recommended by SIL, 644, which,

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1 again, is looking at moisture carryover and looking at
2 conditions in steam lines.

3 MEMBER BONACA: Have you experienced any
4 equipment degradation or failures due to the power
5 uprate?

6 MR. GRANTHAM: We have seen some vibration
7 issues. We implemented our uprate in a two-phased
8 approach. We did some mods, came up to around 113
9 percent power on unit 1, operated a cycle, did mods
10 during the next cycle, and did the full uprate to 120
11 percent.

12 During that interim operating cycle, where
13 we were not at full power, we did have some cycling of
14 our turbine control valves. We were operating at a
15 non-optimum point. We did have some failures of our
16 EHC return lines that were connected to the control
17 valve and due to that cycling and vibration.

18 Now, that's an industry OE issue. It's
19 happened at non-uprate plants. We did replace those
20 lines with a flex connection. We also have had some
21 vibration issues on small socket well drain lines.
22 Again, that's an industry OE issue. We had failures
23 --

24 CHAIRMAN SIEBER: On what, the main steam
25 system?

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1 MR. GRANTHAM: This was actually around
2 our feedwater heaters.

3 CHAIRMAN SIEBER: Okay.

4 MR. GRANTHAM: But that's an industry OE
5 issue. We had failures on those lines before uprate.
6 So did uprate cause it? We attribute it to uprate.
7 And we went in and implemented some modifications to
8 install a more fatigue-resistant well configuration
9 for those socket wells.

10 CHAIRMAN SIEBER: But none of those are
11 safety-related?

12 MR. GRANTHAM: That is --

13 CHAIRMAN SIEBER: None of them are in
14 scope?

15 MR. MIKE HEATH: That is correct.

16 MEMBER BONACA: Unit 2? You said unit 2
17 had a white on plant power changes. I mean, what
18 were the power changes related to?

19 MR. BELLER: The first power change
20 occurred in April of 2005. We can bring a slide up on
21 this so that you don't have to try to remember
22 everything I say here.

23 In April of 2005, we had a reactor feed
24 pump, too broad of a reactor feed pump and peller that
25 failed. And, as a result, we had to reduce power to

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1 60 percent to take that pump out of service and
2 facilitate repairs.

3 In June of 2005, unit 2, -- these are all
4 on unit 2 -- we experienced some debris loading on one
5 of our circ water intake pump traveling screens. And,
6 as a result, the pump tripped. And the operating crew
7 took a conservative action to reduce power to maintain
8 a vacuum in its desired range.

9 August of 2005, we had a dual unit
10 shutdown, another conservative action. We had
11 questions on our differential protection of our diesel
12 generators. And while we were resolving that issue,
13 we did take the units out of service because it was a
14 conservative action taken to declare the diesel
15 generators inoperable.

16 MEMBER BONACA: None of these seem to be
17 related to the power uprate.

18 MR. BELLER: November of 2005 we had three
19 separate instances of leaks in our condenser tubes in
20 the water boxes; actually, one water box, the 2A water
21 box. We are still assessing that as to its
22 applicability to uprate. We haven't had a chance to
23 enter the water box yet. So we have select causes.
24 But we haven't been able to validate our root cause
25 yet.

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1 And then in December of '05, one of our
2 reactor recirc pumps tripped. We had a blown fuse in
3 the voltage regulation circuit. We do have a
4 supplemental inspection scheduled this month by the
5 senior resident at the Harris plant.

6 CHAIRMAN SIEBER: Well, the uprate will
7 give you increased exhaust steam flow from the
8 turbine, --

9 MR. BELLER: That's correct.

10 CHAIRMAN SIEBER: -- which some licensees
11 have experienced increased condenser tube vibration
12 sometimes to the extent that the tubes actually touch
13 one another and wear.

14 Can you tell me where you had tube
15 failures in the condenser?

16 MR. GRANTHAM: This is Mark Grantham
17 again.

18 CHAIRMAN SIEBER: That gives you a clue as
19 to whether it's the exhaust velocity that is causing
20 it or not.

21 MR. GRANTHAM: I guess if you look at the
22 two units, we have had far more tube failures over the
23 years on unit 2 than unit 1. The tube failures we
24 have recently experienced, if you picture our two
25 water boxes, they're up at the top corners of the

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1 tubes.

2 CHAIRMAN SIEBER: Closest to the turbine
3 exhaust?

4 MR. GRANTHAM: That is correct.

5 CHAIRMAN SIEBER: You might want to think
6 about staking those two.

7 MR. GRANTHAM: Well, we retubed our
8 condenser in the mid '80s, and our tubes were pretty
9 heavily staked at that time.

10 CHAIRMAN SIEBER: What kind of tubes do
11 you have?

12 MR. GRANTHAM: They're titanium. And so,
13 like Lenny said, during the outage, that will be a
14 prime inspection point to go in and try to ascertain
15 what is happening there.

16 As an interim measure, we have gone in and
17 we have plugged the tubes along those periphery on the
18 outside.

19 CHAIRMAN SIEBER: Well, that will change
20 with inertia that can give you different vibration
21 modes, which may be helpful.

22 MR. GRANTHAM: But right now we really
23 need to get in and do an inspection to fully
24 understand what is going on there.

25 CHAIRMAN SIEBER: Okay.

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1 MR. MIKE HEATH: We're done with
2 methodology. Any other questions on that? Well,
3 let's take a few minutes to talk about our
4 commitment-tracking process.

5 F. COMMITMENT PROCESS

6 MR. MIKE HEATH: Brunswick uses our
7 corrective action program to track off of it. And the
8 license renewal commitments are handled exactly the
9 same way.

10 The license renewal, we develop an
11 implementation plan for each of our commitments. And
12 the implementation plan lists each thing that we have
13 to do. So every procedure change, any new procedures,
14 new PMs, PM revisions all are contained in those
15 implementation plans.

16 And the actions that we are using to make
17 those changes are tied back to the corrective action
18 program assignment. Each of those actions has a due
19 date. Each of those actions has an owner.

20 In addition, we're developing a program
21 manual for license renewal for Brunswick. That manual
22 will have every requirement to comply with those
23 commitments. And we'll be using that to do periodic
24 assessments to assure that everything is being
25 completed in a timely fashion prior to the period of

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1 extended operation.

2 Any questions on commitments?

3 MEMBER MAYNARD: Your commitment-tracking
4 program or your corrective action program, once you
5 make a procedure or program change to meet your new
6 license condition, what ensures that it doesn't get
7 reversed later?

8 MR. BELLER: The commitment-tracking
9 program is modeled on the NEI guidance. And if the
10 procedure in its entirety is meant to meet the
11 commitment, that will be stated in the purpose
12 section. And then you'll reference the commitment in
13 the reference section.

14 If it's a section of a procedure, we'll
15 put an "R" in the left margin associated with that.
16 And it will say "R-1," for instance. R-1 will point
17 back to the reference where the commitment was made.

18 So not only would you have to do the
19 50.59. You have to go through the commitment change
20 process, which asks a lot of the same questions on
21 this that --

22 MEMBER MAYNARD: It is flagged where it
23 would have to be evaluated before the change could be
24 made?

25 MR. BELLER: That's correct.

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1 MR. MIKE HEATH: That's correct.

2 Other questions on commitments?

3 (No response.)

4 MR. MIKE HEATH: Well, I would like to
5 conclude, then. A few comments concerning the new
6 audit process. We were not the first to go through
7 the audit process, but we had been through the old
8 audit process with our Robinson plant.

9 What we found with the new process is that
10 it was extremely helpful to us to have the opportunity
11 to have staff on site to talk to directly concerning
12 their issues and concerns.

13 We were able to resolve these issues and
14 concerns early on in the process, very early in the
15 process. And we think as a direct result of that, the
16 SER when it was issued was issued with no open items
17 and no confirmatory items.

18 So we were very pleased with it. We're
19 hoping it's working for you as well as we think it has
20 been working for us. Are there any other questions
21 for us?

22 MEMBER BONACA: I had some questions.

23 CHAIRMAN SIEBER: Go ahead.

24 MEMBER BONACA: I have a few questions.

25 One, it was in excessive medium voltage cables, not

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1 environmentally qualified. You have a new program,
2 right, for this cable?

3 MR. MIKE HEATH: Yes.

4 MEMBER BONACA: Now, one thing I noticed
5 is that you do inspect manholes at least every two
6 years --

7 MR. MIKE HEATH: Yes, sir.

8 MEMBER BONACA: -- to remove the water if
9 you find it. Is it all you do or do you do --

10 MR. MIKE HEATH: A water mitigation

11 MEMBER BONACA: Yes. Do you have any
12 initiative to prevent recurrence of accumulation of
13 water?

14 MR. MIKE HEATH: What we're doing on water
15 mitigation for our manholes is the manholes that we
16 inspect are inspected based on our experience in water
17 accumulation.

18 So the idea is we are inspecting those and
19 finding that the water is below the cable. Then we're
20 maintaining that inspection or increasing it or making
21 it longer before finding, in fact, that it has
22 impacted the cable. Then the inspection gets a sooner
23 frequency. So the idea is to make sure that the water
24 doesn't get up to the cables.

25 So, to my knowledge, I'm not sure exactly

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1 what the frequencies are, but most of these
2 frequencies are much sooner than two years. And we'll
3 adjust those depending on what we find.

4 MEMBER BONACA: Okay. But, I mean, your
5 objective is not to have the cable wetted?

6 MR. MIKE HEATH: That's correct. Our
7 objective is to have cable not be wetted when we find
8 it during the inspection.

9 MEMBER BONACA: Okay. So you deal with it
10 by frequency of the inspection?

11 MR. MIKE HEATH: That's correct.

12 MEMBER BONACA: You have no other means?
13 Because this is part of your preventive action
14 program. And so I thought that you may have some
15 initiatives to prevent water from accessing the cable
16 probably.

17 MR. MIKE HEATH: Well, we do do some
18 things associated with that.

19 MEMBER BONACA: Okay.

20 MR. MIKE HEATH: For instance, there is a
21 little catch bowl on the covers of the manholes. But
22 what we're finding when we do go inspect them is the
23 water is not up over the cables.

24 MR. BELLER: In addition, if we did find
25 an unexpected condition, we would enter into the

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1 corrective action program, do an investigation, and
2 corrective actions would come out to address. And it
3 may be a PM frequency increase.

4 MEMBER BONACA: Another question I had was
5 regarding the flow accelerator corrosion problem.
6 There was a discussion in the ACRS regarding piping
7 with super heated steam, essentially noting the
8 problem. Okay?

9 But then there was a discussion of piping
10 with greater than 99.5 percent quality but still some
11 moisture there. And for it, you do not perform
12 inspection for that.

13 MR. MIKE HEATH: Jeff?

14 MR. LANE: What we did was to evaluate
15 that at the very low steam levels, we haven't seen a
16 problem to that effect.

17 MEMBER BONACA: Okay.

18 MR. LANE: So we're making our program
19 parameters as to the new revisions.

20 MEMBER BONACA: Which is okay to me, but
21 you have, first of all, got some verification that you
22 have no problem, right?

23 MR. LANE: Yes.

24 MEMBER BONACA: So you have measured some
25 locations and must be looking at them?

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1 MR. LANE: Yes.

2 MEMBER SHACK: Let me just go back. The
3 new EPRI guidelines would have you include those
4 within the scope of the program?

5 MR. LANE: This is Jeff Lane.

6 The new EPRI guidelines I believe say
7 super heat conditions, basically. And the guidelines
8 that we're operating under I believe are 99.5 percent.
9 So that's the delta that we're talking --

10 MEMBER BONACA: I just had the curiosity
11 more. I wasn't familiar. There is a discussion of
12 TLAAAs regarding the fuel pool girder, tension loss of
13 prestress. What is the design basis for that system?

14 I mean, I was wondering. I understand
15 you're measuring the tension in the cables and then
16 provide correction action in case you have loss of
17 tension.

18 I was wondering about fire. Is there a
19 design basis dealing with fire issues below these
20 girders or not? I was just curious.

21 MR. GRANTHAM: None that I'm aware of.

22 MEMBER BONACA: Okay. No. I understand
23 that concrete is a pretty good protector of steel, but
24 I just wondered if there was -- probably was not a
25 factor other than the design basis, I guess.

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1 MR. MIKE HEATH: Oh, no. We didn't
2 address it.

3 MEMBER BONACA: All right. That was just
4 a curiosity. And I'm done.

5 CHAIRMAN SIEBER: Okay. Anyone else have
6 any questions that they would like to ask the
7 applicant at this point?

8 (No response.)

9 CHAIRMAN SIEBER: And I presume you have
10 concluded your presentation.

11 MR. BELLER: We have concluded our
12 presentation. Thank you.

13 CHAIRMAN SIEBER: Okay. I think it's
14 appropriate that we take a break. And I think a
15 15-minute break would be about right. If you could
16 come back at 20 minutes to 3:00? At that time we'll
17 listen to the staff's presentation.

18 (Whereupon, the foregoing matter went off
19 the record at 2:25 p.m. and went back on
20 the record at 2:40 p.m.)

21 CHAIRMAN SIEBER: We will come back to
22 order.

23 MR. KUC: Mr. Chairman, S. K. Mitra, the
24 project manager, will lead the staff presentation with
25 assistance by Mr. Maurice Heath.

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1 CHAIRMAN SIEBER: Thank you.

2 SER OVERVIEW

3 MR. MITRA: Good afternoon.

4 CHAIRMAN SIEBER: Good afternoon.

5 MR. MITRA: I am S. K. Mitra. I'm the
6 project manager for Brunswick steam power electric
7 plant units I and II license renewal application.

8 To my right is Mr. Maurice Heath. He is
9 a project manager also. He helped me prepare the SER
10 and issue it. And he will present the TLAA section of
11 the presentation.

12 CHAIRMAN SIEBER: Okay.

13 MR. MITRA: I also have Mr. Caudle Julian,
14 the lead inspector from region II, who will present
15 the inspection done by region II. Mr. Greg Cranston.
16 He was here. He will be here. He was the team leader
17 for the audit. And if you have any questions, he can
18 answer that. And also present in the audience are the
19 technical reviewers who contributed to the SER to
20 answer any question that may arise.

21 Next. These are the subjects which we
22 will cover during the presentation. The LRA, the
23 license renewal application, is submitted by letter
24 dated October 18, 2004. And the applicant already
25 described about their boiling water reactor, Mark I

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1 design containment.

2 The plant is located at the mouth of the
3 Cape Fear River in the Brunswick County, North
4 Carolina, two miles north of Southport, North
5 Carolina. Unit 1 expires, license, on September 8,
6 2016; and unit 2, which was started earlier, December
7 27, 2014. And applicant requested an operating
8 license extension for 20 years.

9 Each unit generates about 2,923 megawatt
10 thermal, 1,007 megawatt electrical. That includes 20
11 percent extended power uprate. And, as applicant
12 described before, the five percent power uprate was
13 approved by NRC on November 1996. An additional 15
14 percent was extended on May 2002.

15 Again, I am emphasizing the steam dryer
16 within the scope of license renewal. And applicant
17 committed to review plant and industrial operating
18 experience relevant to aging effects caused by
19 operation at power uprate. The evaluation will be
20 submitted to NRC review one year prior to the period
21 of extended operation. And that's reflected on
22 commitment number 31.

23 This commitment was made in response to
24 ACRS letter of September 16, 2004 on license renewal
25 application of Dresden/Quad Cities.

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1 The SER issued on December 20, 2005. And
2 it doesn't contain any open or confirmatory items. I
3 stop right there. The reason no open or confirmatory
4 items was not that easy on applicant. Staff and
5 applicant had numerous dialogues. If you see, we had
6 174 RAIs via 4 letters. And we had 39 audit questions
7 requiring supplements. And we had numerous dialogues
8 by meeting face to face and conference call.

9 And I have to thank both sides. Applicant
10 and the staff showed a lot of patience and
11 understanding to resolve all the issues raised by RAIs
12 and audit questions.

13 CHAIRMAN SIEBER: A hundred and
14 seventy-four is compared to other previous
15 applications, pretty small number.

16 MR. MITRA: It's a small number. And
17 audit questions, we had 100 in total. And 39 need
18 response under alternate information because there is
19 a change. Compared to what recent count, it's very
20 insignificant.

21 ACRS has three licensing conditions. And
22 these are the usual licensing conditions under each of
23 the previous applications.

24 MEMBER SHACK: The aging management
25 programs and BWRs must be in a sense more consistent

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1 since they all kind of followed the VIP program.
2 There is I would think a lot of standardization that
3 may not be in the other --

4 MR. MITRA: If you are asking that
5 question because the RAIs are smaller, it's not true
6 because what I heard from other BWR plants that are
7 being reviewed right now, the questions --

8 MEMBER SHACK: Are still --

9 MR. MITRA: Higher. So I have to assume
10 the application was better than most other BWRs.

11 Through the review, three items that we
12 brought into scope are switchyard breakers; service
13 water intake structure fan, dampers, bird screen; and
14 condensate storage tank piping credited for SBO. I
15 will describe this while I go further in the slide.

16 The NRC review process is usual. We do
17 scoping and screening methodology audit. We go. We
18 went there to the plant to do consistency with GALL
19 audits two times: AMPs, aging management program; and
20 aging management reviews.

21 The technical staff, the portion that is
22 not consistent with GALL, the technical staff did
23 in-house safety review. And we had regional
24 inspection, which contains scoping and screening
25 inspection and aging management program inspection.

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1 And Caudle will elaborate on that later on.

2 This is the time line we had when we went
3 to the site. You see the GALL audits are done right
4 in the beginning, within a couple of months, three
5 months after the application and then scoping and
6 screening methodology audit. And then we had last,
7 but not the least, the regional inspections.

8 On section 2, the structural components
9 subject to aging management review, we have section
10 2.1 had scoping and screening methodology. Staff
11 audit and review concluded the applicant's methodology
12 satisfies the rule pursuant to 10 CFR 54.4(a) and 10
13 CFR 54.21.

14 Section 2.2, "Plant Level Scoping
15 Results," staff identified no omission of systems and
16 structures within the scope of the license renewal as
17 defined by 10 CFR 54.4 criterion.

18 A. SCOPING AND SCREENING RESULTS

19 MR. MITRA: Section 2.3, "Scoping and
20 Screening Results of Mechanical Systems," as usual in
21 other applications, we had reactor vessel, internals,
22 reactor coolant system. We have engineered safety
23 features. We have auxiliary systems. And we have
24 steam and power conversion.

25 What is new is this is the first time

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1 staff have reviewed balance of the plant scoping and
2 screening review in a two-tiered process. The staff
3 presented this concept to ACRS full committee on March
4 4th, 2005. And I guess they got the blessing and
5 explained the review process at that time.

6 Two-tiered process, two-tier scoping
7 review based on screening criteria of safety
8 importance/risk significance, systems susceptible to
9 common cause failure of redundant trains, operating
10 experience indicating likely passive failures, and
11 previous license renewal application review experience
12 of omissions.

13 The tier 1 review actually has the screen
14 and review the license renewal application and FSAR
15 and identifies certain systems, samples certain
16 systems for inspection. And we will cover that there
17 are three systems that were referred to for
18 inspections during the written inspection.

19 In tier 2 review, which is more detailed,
20 they go through the boundary drawings, other licensing
21 basis documents, such as plant, you know, relief
22 request and all of this. And they look at, of course,
23 the application in FSAR.

24 There are 62 mechanical systems. And out
25 of that, 39 are the balance of the plant, most

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1 auxiliary and steam and power conversion systems. Out
2 of that 39, 15 balance of the plant systems selected
3 for tier 1 review. And 24 are selected for tier 2
4 review. The rest of 23 mechanical non-balance of the
5 plant systems are RCS, engineered safety features,
6 some auxiliary systems, continue to receive tier 2
7 review. And obviously electrical and structure
8 receive tier 2 review.

9 MEMBER WALLIS: Now I've got a question
10 about something here.

11 MR. MITRA: Okay.

12 MEMBER WALLIS: When you're figuring out
13 what is in scope, just take an example. There is a
14 heat exchanger for the fuel pool cooling system. It's
15 got tubes in it. The heat is removed, and it goes
16 into the reactor-building closed water cooling system.

17 The only thing that is in scope is the
18 shell and access cover, channel head and access cover.
19 So it looks as if what you are worried about is the
20 outside of this heat exchanger. You don't want to
21 leak into the environment. That's presumably because
22 you don't want water from the fuel pool cooling system
23 to go out into the building.

24 But doesn't it matter if it goes from that
25 into the service water system and through the tubes?

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1 And doesn't it matter if the heat isn't transferred?
2 Why is only the shell in scope? Why isn't the
3 internal function also in scope in some way?

4 MR. MITRA: My first crack will be the
5 shell is in scope because it is giving you the
6 boundary at the outside. And why it's not out inside
7 of the shell is not I don't have the answer. Any of
8 us --

9 MEMBER WALLIS: So you don't care if the
10 water goes into the building, into reactor building
11 closed cooling water system. It doesn't matter. But
12 it does matter if it goes into the building. It just
13 seems a bit odd to break it up that way. It says
14 something about a fluid-retaining boundary. But the
15 tubes also retain the fluid, don't they?

16 But, anyway, I just raise that because I
17 am a little puzzled by how you decide what is and is
18 not in scope. In some of these things, the condensate
19 cooler tubes are in scope. And then the tubes are not
20 in scope for this other heat exchanger. I'm so
21 puzzled by how you decide when the tube is in a heat
22 exchanger and scope and when they are not.

23 MR. MITRA: Bill Rogers will address the
24 question.

25 MR. ROGERS: I'm Bill Rogers from Division

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1 of Engineering.

2 I did the scoping and screening
3 methodology audit. I can't answer the particulars for
4 that piece of equipment, but just in general, to
5 determine whether the item would be in scope or not,
6 it would have to fall into one of the three
7 categories: (a)(1), (a)(2), or (a)(3). And that
8 would be based on the intended function of the item.

9 If it had a safety-related function, it
10 would be in scope for (a)(1). And if it was a
11 non-safety-related item that supported the function of
12 another safety-related system, it would be in scope
13 for that purpose. But that's the beginning for the
14 determination of whether it's in scope. I can't speak
15 to the specific review of that component.

16 Does that help address your question?

17 MEMBER WALLIS: Is there something called
18 a pressure-retaining boundary that uses a criterion,
19 then?

20 MR. ROGERS: No.

21 MEMBER WALLIS: That's what comes up in
22 the write-up. It talks about pressure-retaining
23 boundaries. Well, maybe this is too complicated.

24 MR. KUO: The pressure-retaining boundary,
25 Dr. Wallis, is one that actually advanced to the

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1 category (a)(1). That is the safety-related structure
2 systems.

3 MEMBER WALLIS: What you really mean is a
4 fluid-retaining boundary, isn't it? Pressure isn't
5 something you retain. You retain the fluid and
6 something that keeps the fluid from getting out into
7 somewhere else. So that's why I wondered why tubes
8 aren't also.

9 But, anyway, let's move on. I'm just
10 puzzled by this.

11 CHAIRMAN SIEBER: Maybe I can add a little
12 something to it. Being a safety-related component
13 means that it mitigates one of the design basis
14 accidents, of which loss of fuel pool cooling is not
15 one.

16 Typically in a fuel pool cooler, the
17 service water side of it is at a higher pressure than
18 the pool water. So if the tubes fail, the water leaks
19 into the pool, as opposed to the pool leaking out to
20 the service water and then to the environment.

21 So from the standpoint of being able --

22 MEMBER WALLIS: That's not too good
23 because the pool then overflows, then?

24 CHAIRMAN SIEBER: Yes. On the other hand,
25 you know, that's an easier thing to control than

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1 trying to cool the pool and having the pool water
2 escaping to the river. And that's why they designed
3 it in that kind of a fashion.

4 So it's not unreasonable, at least in my
5 way of thinking of things, to say that the fuel pool
6 cooling heat exchanger is not safety-related because
7 it doesn't relate to the design basis accidents.

8 On the other hand, it's important from the
9 standpoint of preserving the service water system,
10 which is used for other mitigating equipment. And you
11 can still perform the function, even if some tubes
12 leak. You know, it takes a long time to heat up the
13 pool anyway.

14 MEMBER BONACA: The licensee, is this a
15 correct evaluation that Mr. Sieber made?

16 MR. LANE: I'm Jeff Lane with Progress
17 Energy.

18 The fuel pool heat exchangers are in scope
19 for special interaction. RBCCW, our closed cycle
20 cooling water system, doesn't perform any
21 safety-related cooling functions at Brunswick. So
22 we're concerned with the fuel pool heat exchangers
23 basically not leaking into the reactor building
24 environments.

25 Should an RBCCW tube leak, interaction

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1 between RBCCW and fuel pool cooling would not cause an
2 adverse interaction to the environs. It would be
3 something we would have to address in the course of
4 plant operation but not an issue that would affect
5 license renewal scoping.

6 CHAIRMAN SIEBER: One cause of an accident
7 or preventive mitigation of a design accident, --

8 MR. LANE: Right.

9 CHAIRMAN SIEBER: -- design basis
10 accident.

11 MEMBER BONACA: You get more than a
12 passing grade.

13 CHAIRMAN SIEBER: Pardon?

14 MEMBER BONACA: You deserve more than a
15 passing grade. You are correct.

16 CHAIRMAN SIEBER: I'm going to write that
17 down. Okay.

18 MR. MITRA: We mentioned before that
19 condensate storage tank piping credited for SBO
20 brought into the scope. There's some pipes that were
21 not in scope. The condensate storage tank was in
22 scope, but the piping was not. And due to mechanical
23 system review, there are some RAIs that brought into
24 the piping in scope.

25 And also service water intake structure

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1 fan, the bird screen, and damper housings are brought
2 into scope. And this is also through a RAI process.

3 MEMBER WALLIS: A fan is in scope?

4 CHAIRMAN SIEBER: Yes.

5 MR. MITRA: It is.

6 MEMBER WALLIS: What has that got to do
7 with safety?

8 CHAIRMAN SIEBER: It's service water
9 safety-related.

10 MR. MITRA: The service water
11 infrastructure is in scope. So that's why the fan,
12 the screen, and the damper housing are brought into
13 scope.

14 MEMBER WALLIS: Well, okay.

15 CHAIRMAN SIEBER: It is better to be in
16 scope than out of scope.

17 MR. MITRA: This is 2.4, scoping and
18 screening of structures. And there are two types of
19 structures. One is containment. Another is class I
20 and in-scope structures and buildings. There are 15
21 of them.

22 Section 2.5 has scoping and screening as
23 a result of electrical and instrumentation control I&C
24 systems. And the guidance contained in 95-10,
25 appendix B was used to develop a list of electrical

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1 I&C community groups.

2 Dr. Wallis, your question about the light
3 bulb was in that NEI 95-10, appendix B had listed it
4 as scope, but it's screened out because of its active
5 components. So there is no aging management review on
6 that.

7 MEMBER WALLIS: Oh, it is an active
8 component?

9 CHAIRMAN SIEBER: Yes.

10 MR. MITRA: The switchyard breakers at 230
11 kv gas-filled power circuit breakers, represent the
12 first breakers for the SBO recovery path that are
13 brought into scope of the license renewal process.

14 In summary, the applicant scoping
15 methodology meets requirements of 10 CFR part 52. The
16 scoping and screening results as amended included all
17 system structural components within the scope of
18 license renewal and subject to aging management
19 review.

20 And now I give the floor to Caudle Julian
21 for licensing and inspection.

22 CHAIRMAN SIEBER: Welcome.

23 MR. JULIAN: Hello. Thank you.

24 B. ONSITE INSPECTION RESULTS

25 MR. JULIAN: My name is Caudle Julian from

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1 NRC region II in Atlanta. And I have led the team
2 inspections for license renewal for all of the region
3 II plants, here today to talk about the Brunswick
4 inspection that we did last June.

5 The slide you see up there now lists the
6 topics we are going to talk about. If we can click
7 over to the next one? It's one you have seen before,
8 to tell you again that we have a manual chapter,
9 25-16, and an inspection procedure, 710.02, that we
10 follow for these inspections. We develop a
11 site-specific inspection plan for each one. And they
12 are scheduled to support NRR's review schedule.

13 We have two portions to our inspection,
14 scoping and screening inspection, area, which has the
15 objective to confirm that the applicant has brought
16 the right stuff into scope. And S. K. has portrayed
17 it here as the first half of the inspection was that.
18 It was probably less than half of a week of effort
19 this time.

20 We were using our new procedure, where we
21 have revised 710.02 to reduce the amount of resources
22 that we put on scoping and screening. We have talked
23 about that before. And we will focus primarily on
24 (a)(2) situations, non-safety equipment that can
25 affect safety.

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1 We took from NRR's request to look at
2 three of their tier I systems that they had questions
3 about. And you can see they are non-safety systems:
4 heat tracing, moisture separator reheater drains and
5 reheat and heater drains and miscellaneous vents and
6 drains. And those systems are, of course, out in the
7 balance of plant. And one would not think that that
8 would be a safety-related function there.

9 We went out with the applicant people and
10 walked those systems down and concluded that they had
11 done a good job and that those systems were very
12 conservatively brought into scope.

13 MEMBER WALLIS: Why would you pick those?
14 I would think you would look at things like bulges on
15 the containment floor or something. These seem to be
16 so far removed from safety systems.

17 MR. JULIAN: I agree with you. Those
18 selections were made by NRR as ones for us to look at.

19 MR. MITRA: As I described before, -- this
20 is S. K. Mitra again -- this is a process that
21 followed in tier I and tier II, two tiers of review of
22 the balance of the plant system. And maybe Mr. Chang
23 can explain why he chose this system particularly.

24 DR. CHANG: We used a two-tiered review
25 process to deal with the balance of planning systems,

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1 which it has 29 of them. We will put our focus to
2 have detailed review on the tier II review and
3 grouping that 15 out of 39 systems into tier I.

4 Among those 15 systems, I looked at it.
5 I pick up three out of 15 because those systems, most
6 of those systems involve the (a)(2), which the
7 application by itself doesn't tell me much. And even
8 if I look at the drawings, it's still not enough
9 information for me to make a determination.

10 However, if we go to either very detailed
11 review of all those systems, we think we would rather
12 have our focus and attention, resource put on the rest
13 of the more important systems.

14 So among those 15 less important systems,
15 our review process, review application description,
16 the FSAR descriptions, but we are not able to go into
17 the detailed drawings.

18 We ask the inspecting teams to go in
19 there, look at the systems, look at the drawings, look
20 at the calculations by self so that they would be able
21 to look at the methodologies of doing this, true
22 systems. And once we have the three systems group
23 being scoped properly, we would be able to have
24 confidence on those 15 systems, which have the similar
25 way of doing a true process. So that's how we draw

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1 the three systems that are necessarily important.
2 Actually, they are not very important. It's on the
3 first screening, two-tiered screening, process.

4 MR. JULIAN: So his real answer is there
5 were none better to select from. The group that we
6 had to look at were out on the --

7 MEMBER WALLIS: But if you were to find
8 something wrong with the heat tracing systems, that
9 wouldn't have prevented license renewal, would it? I
10 mean, it's not an important issue.

11 MR. JULIAN: No. So we were looking at
12 ones here that they had brought into scope. We were
13 looking to see that they had identified that you can't
14 tell about --

15 MEMBER WALLIS: You're testing their
16 approach and their methods and so on. That's what
17 you're doing.

18 MR. JULIAN: Yes. We're actually going
19 out and looking at the hardware.

20 MR. GILLESPIE: Frank Gillespie.

21 Let me say it a different way. We don't
22 want to inspect what we already know is in. What
23 they're doing is testing what the licensee has not
24 included to see if it should have been in. So, in
25 fact, if the inspectors are actually looking at an

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1 important system, we have done something wrong because
2 that means the licensee left an important obvious
3 system out of scope.

4 So what we're really testing here is the
5 (a) over (2) methodologies in the fringe systems. I
6 mean, that's more simply what we're really doing.

7 So you're actually looking for what is not
8 included, as opposed to inspecting what they have
9 already volunteered, is going to be managed.

10 MR. JULIAN: And Brunswick was rather
11 conservative, I think. There were not many borderline
12 cases that we had big disputes about in Brunswick.

13 Moving on, the second half of the
14 inspection was the aging management program. The
15 objective is confirmed that the existing AMPs are
16 managing current age-related degradation and that they
17 have -- we found that they had established a very
18 comprehensive implementation plan in their plant
19 acquisition request system -- that was talked about as
20 a corrective action program earlier -- to track the
21 committed future actions.

22 We found in our inspection a few examples
23 where actions committed in aging management program
24 description documents were not yet into the
25 implementation plan.

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1 These were only two or three examples.
2 And we think the issue was that they were not yet.
3 They had been recently committed to by NRR, but when
4 these were pointed out, the applicant promptly made
5 changes to the documents and included the comments
6 that we have had.

7 In our walk around Brunswick -- and we did
8 one look-see inside the drywell during a refueling
9 outage -- we thought that the material condition of
10 the plant was being adequately maintained. The
11 documentation that we saw was a very good quality and
12 was supported by a comprehensive computer database
13 controlling equipment that we spoke of earlier.

14 One other issue that we normally talk
15 about here is what is the current performance of the
16 plant with respect to the reactor oversight program.
17 Brunswick unit 1 you can see we have here the third
18 quarter performance indicators that are posted on our
19 Web site.

20 I believe the fourth quarter is just any
21 day now we'll be coming out fourth quarter of 2005.
22 Look to the next, please. There is nothing remarkable
23 here, of course. Both of these are green. As the
24 applicant has described to you, they had a bad run of
25 luck in 2005 and had numerous power reductions. And

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1 that performance indicator is going to go white on
2 unit 2 in the new data that is coming up on our Web
3 site here in the very near future.

4 The criteria is the number of power
5 reductions below 80 percent unplanned. And if you
6 have things like condenser tube links, these kind of
7 things happen but pose no particular negative light on
8 the capability of performance to the operators and so
9 on in the plant. It's just equipment problems that
10 happen to them that put them in these circumstances.
11 And that really --

12 CHAIRMAN SIEBER: It doesn't reflect on
13 the performance of operators. On the other hand, it
14 may reflect somewhat on the condition of the plant.

15 MR. JULIAN: Yes.

16 CHAIRMAN SIEBER: That's why it's a
17 performance indicator.

18 MR. JULIAN: Yes. Well, that concludes
19 what I have to say. Do you have any questions?

20 (No response.)

21 MR. JULIAN: Thank you.

22 CHAIRMAN SIEBER: Thank you, Caudle.

23 AGING MANAGEMENT PROGRAM REVIEW AND AUDITS

24 MR. MITRA: We'll go ahead and start
25 section 3, "Aging Management Review Results." We have

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1 the usual internal reactor coolant system. And you
2 see a separate feature of the system, steam and power
3 conversion system, containment structure, and
4 component support and electrical.

5 The total, we have a management program of
6 34. Only nine are consistent with GALL. Consisting
7 of GALL with deviations is 20. And plant-specific are
8 five.

9 The example we have of audits and built-in
10 findings in the audit times, the Brunswick stimulator
11 plant recent form ISI program was revised according to
12 the EPRI topical report ER 112.657, which is not
13 consistent with GALL, really.

14 ISI does not recognize the changes
15 recommended by the EPRI report. As a result, the
16 applicant revised the upsert to include pruritic,
17 volumetric, surface, and visual examination of the
18 component which is consistent with GALL. They
19 actually according to the EPRI report, took that out.
20 So we included that little bit during the audit
21 process, and they put it in there, actually, again.

22 The second one bullet is originally --

23 MEMBER SHACK: Let me understand. When
24 they go to a risk-informed ISI program, that is
25 reviewed by the staff and approved, right?

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1 MR. MITRA: Apparently this is a topical
2 report here. 112657 was a recent report. And the
3 applicant thought that they can follow that without
4 going through the NRC's review.

5 But the staff found that, and they said
6 it's not being -- you know, the staff did not really
7 recognize that EPRI report. And they go according to
8 the consistent. As in the GALL, it's the volumetric
9 and the surface and visual examination was included in
10 GALL. And according to the EPRI report, they just
11 took that out.

12 MEMBER BONACA: I thought this was only
13 pertaining to small bore piping. There's an exception
14 here of moving from ISI. I mean, I thought the logic
15 was, as in GALL, that you're looking for susceptible
16 locations as a lead indication for use. Therefore,
17 you don't want to have a risk-informed approach.

18 But I thought that this was really
19 pertaining to small bore piping.

20 MR. MITRA: I think it's not just the
21 small bore piping.

22 MEMBER BONACA: Okay.

23 MR. MITRA: It's for everything else.

24 Greg, do you have something to add on
25 that? Greg Cranston is our leader.

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1 MR. CRANSTON: My name is Greg Cranston.
2 The concern we have is we don't want the risk-informed
3 ISI to be a basis for elimination of inspections. So
4 it covers primarily the small bore but other areas,
5 too. It's kind of like really for questions, things
6 like that that we don't want them to cite those as
7 reasons now. So that's how we cover it.

8 MEMBER BONACA: Pertaining only to small
9 bore piping or all piping?

10 MR. CRANSTON: I know it pertains to small
11 bore piping. I'm not sure if it extends beyond that.

12 MEMBER BONACA: The issue has always been
13 the small piping. I mean, that's my understanding.

14 MR. MEDOFF: This is Jim Medoff of the
15 Division of Component Integrity. We're the division
16 responsible for granting relief requests under
17 50.55(a).

18 Licensees are required to get any
19 risk-informed ISI programs submitted in a relief
20 request and approved by the staff. For small bore
21 pipe, we in the past have come up with -- they are
22 exempted by the code, but we still need one of them
23 managed for license renewal. So we came up with a
24 risk-informed approach to select a sampling of small
25 bore pipe.

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1 And we're talking about small bore pipe
2 with full penetration but for inspection. And they
3 can use a risk-informed approach to pick the locations
4 that they're going to select on the sampling basis.

5 So the risk-informed ISIs are only granted
6 normally for the ten-year intervals. And they reapply
7 once they're coming up for the next interval.

8 MEMBER BONACA: So what you're saying is
9 that you're looking for susceptible locations.
10 However, you're using a risk-informed approach?

11 MR. MEDOFF: Yes, meaning --

12 MEMBER BONACA: How do you do that?

13 MR. MEDOFF: It's based on, I think the
14 approach, if I'm not mistaken, is based on, those
15 locations that would impact the PRA most and have the
16 most susceptibility for failure, a combination of the
17 two.

18 MEMBER BONACA: To me it is a change from
19 what I -- maybe I am just behind the time, but --

20 MR. MEDOFF: Actually, this has been
21 incorporated into the revision, into the new small
22 bore AMP for the revised GALL.

23 MEMBER BONACA: So I'll have to do a
24 little bit better. Thank you.

25 MR. MITRA: The second bullet is the

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1 applicant already committed to inspect and clean RHR
2 emergency diesel generator jacket water heat exchanger
3 prior to creating an exchanging operation.

4 This is in lieu of any test result of the
5 heat transfer capability of heat exchanger as
6 recommended by GALL. So they modified the open cycle
7 cooling water heating management program to include
8 performance testing of heat transfer capability.

9 There are a couple of more examples. They
10 originally committed to inspect buried piping only
11 during opportunistic inspection. And due to all the
12 questions, they modified. And they have agreed to
13 perform periodic inspection, at least once every ten
14 years. But opportunity inspection can qualify for
15 periodic inspection.

16 And also the inspection and coated piping
17 has to be done by the coating inspector. Also, that
18 they have put in commitment number 13.

19 MEMBER BONACA: So now they're consistent
20 with GALL?

21 MR. MITRA: Yes, they are consistent with
22 GALL. And that's the new GALL.

23 MEMBER BONACA: The new GALL, yes.

24 MR. MITRA: The new GALL.

25 MEMBER BONACA: Yes.

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1 MR. MITRA: And the structural monitoring
2 program was not originally consistent with GALL. The
3 modified aging management program, the commitment
4 number 16 said they include the inspection of so much
5 portion of the service water infrastructures on a
6 frequency not to exceed 5 years and specific in-well
7 groundwater monitoring inspection frequency of
8 concrete structures and specific inspection frequency
9 for service water intake structure and intake can all
10 not exceed 5 years.

11 MEMBER WALLIS: Five years is a strange
12 measure of frequency.

13 MR. MITRA: Well, I really don't know
14 where the five years come from.

15 MEMBER WALLIS: I understand what you
16 mean, but it is a sort of tortuous way to put it.
17 Frequency is so much per year or something, isn't it?

18 DR. CHANG: This is Ken Chang.

19 What it really means is he inspected at
20 least once every five years. It doesn't mean
21 frequency.

22 MEMBER WALLIS: It doesn't make sense.

23 DR. CHANG: The word "frequency" is being
24 used in a different meaning. I agree.

25 MR. MITRA: Reactor vessel internal and

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1 reactor coolant system have five plant-specific
2 systems, which is reactor vessel and internal neutral
3 monitoring system, reactor manual control system,
4 control rod hydraulic system, drive hydraulic system,
5 and the reactor coolant recirculation system.

6 Reactor vessel internal structure
7 integrity program, the program is a plant-specific
8 aging management program. The inspections, the
9 program inspections, are based on the augmented
10 inspection recommended by the BWRVIP. And the
11 applicant committed to, which I think is commitment
12 number 22, define which BWRVIP reports are included in
13 the scope of the program, additional specific
14 augmented activities that will be taken by the
15 applicant. So if you see commitment number 22,
16 there's a list of all the BWRVIP programs that will be
17 included, almost a one full list.

18 Reactor vessel surveillance program, the
19 program monitors for the impact of neutron irradiation
20 on the fracture toughness properties of RV material.
21 The program is based on the integrated surveillance
22 program criteria, BWRVIP-78 and 86.

23 The applicant is committed to enhance the
24 program to include conformance with updated integrated
25 surveillance program criteria, VIP-116, BWRVIP, once

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1 approved by NRC. And I know that it is being
2 submitted to NRC and it's being reviewed now,
3 BWRVIP-116.

4 Engineered safety features, they obtain
5 plant-specific systems. And in response to one of the
6 RAIs, the applicant committed to manage the loss of
7 material in tracking and small bore class I
8 piping-treated water, including steam and internal
9 environment, using one-time inspection.

10 Auxiliary system, 34 plant-specific
11 systems. Applicant committed to add preventative
12 maintenance program, routine sampling and analysis to
13 address corrosion concern related to potential water
14 intrusion into lubricating oil in the service water
15 pump motor cooler coils and the emergency diesel
16 engines lube oil system. That's commitment number 24.

17 Additionally, applicant committed to add
18 to one-time inspection program at least one of the
19 four emergency diesel engine sumps and at least one of
20 the ten service water pump lubricating oil cooling
21 coils for corrosion products and evidence of moisture.
22 That's commitment number 11. And this is also in
23 response to RAI.

24 MEMBER WALLIS: So one out of 10 is a good
25 enough sample?

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1 MR. MITRA: Richard? Anybody else in
2 there can answer that, the sampling size? No? Well,
3 we can take this --

4 MEMBER WALLIS: You can conclude that if
5 no moisture leaked into one of these, then it's likely
6 it didn't leak into any of the other ones?

7 MR. MITRA: I don't --

8 MEMBER WALLIS: I don't think it's a big
9 issue. I just wonder, though, why one is enough.

10 MR. MITRA: We can take this action. And
11 we will find out. If applicant has any answer for
12 this, why one in ten is --

13 MR. LANE: This is Jeff Lang with Progress
14 Energy.

15 As far as one in ten, I don't recall a
16 specific basis, but I can say that any time that we
17 change lube oil and empty the sumps, we do an
18 inspection. In actuality, there will be many more
19 inspections, and it's done. We will document one of
20 them for the propose of license renewal.

21 MEMBER WALLIS: That makes more sense.

22 MR. MITRA: Do you need further
23 clarification?

24 MEMBER WALLIS: No. That's okay. If
25 they're doing it all the time, that's all right.

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1 MR. MITRA: Okay. The steam and power
2 conversion systems, they have 13 plant-specific
3 systems. The applicant's AMR result for titanium
4 components in a raw water environment was an issue
5 requiring additional information.

6 The applicant clarified that the titanium
7 in a raw water environment at a temperature less than
8 160 degrees Fahrenheit does not exhibit aging effects.
9 The titanium tubes in a raw water environment are at
10 a temperature less than 160 degrees Fahrenheit.

11 MEMBER WALLIS: What is raw water? I
12 understand what pure water is.

13 CHAIRMAN SIEBER: Raw water means comes
14 straight from the river.

15 MR. MITRA: It's raw. Raw means it's
16 unpurified water.

17 CHAIRMAN SIEBER: It comes out of the
18 river.

19 MR. MITRA: It comes out of the river.

20 CHAIRMAN SIEBER: Yes.

21 MEMBER WALLIS: So you don't really know
22 what is in it. It could be anything.

23 CHAIRMAN SIEBER: You'll find out if you
24 drink it.

25 MEMBER WALLIS: Titanium doesn't react

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1 with anything.

2 MR. MITRA: Containment, structure, and
3 component supports. As I said, containment and other
4 15 structures and buildings there. Brunswick steam
5 electric plant credits ASME section XI, subsection IWE
6 and 10 CFR part 50, appendix J for management for a
7 drywell liner. And I think the applicant went through
8 detail on that.

9 Both IWE and appendix J require 100
10 percent inspection per period. There are three
11 periods per interval, and each interval is ten years.
12 And the 100 percent inspection is for the accessible
13 area, but if corrosion is noticed during inspection,
14 10 CFR 50.55(a) is demanded to inspect the
15 corresponding non-accessible area also.

16 Each period is 3.3 years. If you divide
17 10 by 3, it's 3.3. The Brunswick outage they have
18 every 24 months. The BSAP, the Brunswick plant, the
19 partial inspection in each outage, they do the partial
20 in each outage, but complete, 100 percent they do in
21 2 outages. So as a result of the fourth outage, which
22 is after 8 years, they are required to do 100 percent
23 inspection the last.

24 This is inaccessible concrete in
25 acceptable range for non-aggressive environment,

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1 inaccessible concrete more than 5.5 pH and less than
2 500 ppm for chloride and less than 1,500 ppm for
3 sulfates. And groundwater phosphate is .12 ppm. As
4 a result, we concluded that below-grade environment is
5 quite non-aggressive.

6 The electrical and I and C program,
7 component/commodities subject to AMR, there are six of
8 them: the Non-EQ insulated cables and connections,
9 phase bus, non-EQ electrical and I and C penetration
10 assembly, high-voltage insulators, switchyard bus, and
11 transmission conductors.

12 In response to RAI, applicant committed to
13 add preventive maintenance program and periodic
14 inspection of high-voltage insulators for water
15 beading on silicone coating and for age-related
16 degradation. That is commitment number 24.

17 And in another RAI, applicant committed to
18 include in the phase bus aging management program
19 inspecting the interior condition of the bus enclosure
20 for foreign debris, excessive dust build-up, and
21 evidence of water inclusion, and use a structural
22 monitoring program to inspect the external surface of
23 the phase bus housing, checking the accessible and
24 inaccessible phase bus voltage connection by
25 thermography on a ten-year frequency while bus is

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1 energized and loaded. That is commitment number 25.

2 Now we will go to the TLAAs. And my
3 colleague Maurice Heath will address the TLAA portion.

4 TIME-LIMITED AGING ANALYSES NRR

5 MR. MAURICE HEATH: Good afternoon. Like
6 he said, my name is Maurice Heath. And I will be
7 doing section 4, time-limited aging analyses overview.

8 Section 4.1, we have identification of
9 TLAAs. And that is based on by definition 10 CFR
10 54.3. Section 4.2 through 4.7 are the six main
11 categories for the TLAAs, and I will be touching each
12 one of them in the following slides. One note I would
13 like to add is, if you notice, 4.5, concrete
14 containment, tendon prestress, is not applicable to
15 Brunswick.

16 For section 4.2, "Reactor Vessel Neutron
17 Embrittlement," there were ten TLAAs identified. If
18 you notice, the last bullet, "Reactor Vessel Thermal
19 Shock Reflood Analysis," was added in response to a
20 staff's RAI.

21 MEMBER WALLIS: Just wait a second.

22 (Pause.)

23 MEMBER WALLIS: Okay. Go ahead.

24 MR. MAURICE HEATH: Now I want to
25 highlight for section 4.2 two important analyses that

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1 were done by the staff or by the applicant and
2 verified by the staff. The first one is on the
3 reactor vessel, "Upper Shelf Energy," and "Equivalent
4 Margins Analyses."

5 Now, the applicant, what they used was
6 from the guidelines of the BWRVIP-74. It established
7 acceptance criterion. And, if you notice, we have
8 their calculations here. And also the staff performed
9 independent calculations to verify the applicant's
10 conclusions. And the values were all under the
11 acceptance criterion.

12 MEMBER WALLIS: What time are these values
13 for? Is this for a certain time in the history of the
14 plant? This is after so many years or something?

15 MR. MAURICE HEATH: Yes.

16 MR. MITRA: Yes.

17 MEMBER WALLIS: And this is -- what is it,
18 56 equivalent years or something?

19 MR. MAURICE HEATH: Fifty-four.

20 MEMBER WALLIS: Fifty-four?

21 MR. MAURICE HEATH: Fifty-four.

22 MEMBER WALLIS: This is the end of the new
23 license period. Is that what it is?

24 MR. MAURICE HEATH: Yes.

25 MEMBER WALLIS: Well, I'm glad you have a

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1 table. When I read the text, I couldn't figure out if
2 they were meeting criteria or not. There seemed to be
3 such a lot of discussion going on. I couldn't tell.
4 I mean, there were different numbers that appeared at
5 various places in the text. I couldn't tell whether
6 they were meeting the criteria.

7 Now you've made it clearer by having a
8 table. Did I miss something? Was this table in the
9 text or --

10 MR. MAURICE HEATH: Was it in the SER?

11 MEMBER WALLIS: Yes.

12 MR. MITRA: No.

13 MR. MAURICE HEATH: No, it was not.

14 CHAIRMAN SIEBER: A picture is worth 1,000
15 words.

16 MEMBER WALLIS: Yes.

17 MR. MAURICE HEATH: Did you have any more
18 questions?

19 CHAIRMAN SIEBER: It seems to me that
20 these vessels have a lot of margin.

21 MR. MAURICE HEATH: Yes. Conservative.
22 Yes, they are.

23 MEMBER WALLIS: Well, this is one of these
24 things. Are you going to talk about this? The next
25 one is the RTndt.

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1 MR. MAURICE HEATH: Yes. Yes. Now, this
2 is reactor vessel circumferential weld and axial weld,
3 the probability failure analysis. And the guidelines
4 used for the circ welds and axial welds were
5 BWRVIP-05. What it was was the mean RTndt acceptance
6 for probablistic fracture mechanics and BWRs.

7 MEMBER WALLIS: Where does the Charpy
8 value come into all of this? Is that what the --
9 these foot pounds of Charpy value, are they part of
10 this somewhere?

11 MR. MAURICE HEATH: Jim may have to
12 address that.

13 MEMBER WALLIS: They are also part of this
14 material.

15 MR. MEDOFF: Right. This is Jim Medoff of
16 the staff. I was the reviewer for the neutron
17 embrittlement TLAAs.

18 MEMBER WALLIS: The numbers in the text
19 seem to have nothing to do with this.

20 MR. MEDOFF: If you're talking --

21 MEMBER WALLIS: It's a different thing,
22 isn't it, from the foot pounds and the Charpy values?

23 MR. MAURICE HEATH: Are you referring to
24 the previous slide?

25 MEMBER WALLIS: Well, this isn't my field,

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1 but I was trying to figure out what was going on. I
2 had all of these numbers of Charpy values, 45, 30,
3 everywhere, 45, 57.4 or something, no indication of
4 whether or not they met a criterion or what the
5 criterion was? That's what I was missing.

6 MR. MEDOFF: This is Jim Medoff of the
7 staff. The requirements are for upper shelf energy,
8 but the BWR performed some generic equivalent margins
9 analyses for all of the boiling water reactors in the
10 fleet. And that's what the fleet is currently using.

11 There is one plant-specific equivalent
12 margins analysis for the reactor vessel nozzle forging
13 Brunswick is using because I had performed that review
14 in I think it was like 1998 for them.

15 MEMBER WALLIS: So that's the same thing
16 as the upper shelf energy?

17 MR. MEDOFF: Yes. Well, it's to prove
18 that if they go below the 50-foot pound requirement at
19 10 CFR part 50, appendix G, that they would still have
20 acceptable safety margins and upper shelf energy.

21 For the VIP documents, they valued
22 different types of reactor vessel materials and base
23 their equivalent margins analyses based on the --

24 MEMBER WALLIS: So these numbers are foot
25 pounds, these numbers we see here?

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1 MR. MEDOFF: Yes.

2 MEMBER WALLIS: From the fluence, right?

3 MR. MEDOFF: For the BWRVIP-74A, those are
4 in percent drop in foot pounds and allowable percent
5 drop in foot pounds for a group of materials. So for
6 the limiting plate, it's based on the assessment of
7 BWR plates and --

8 MEMBER WALLIS: Is the SER complete? I
9 mean, I had a lot of trouble reading the SER to figure
10 out what all of these numbers had to do with some
11 criterion. If you could make it clearer in some way
12 in the SER, it would help a lot.

13 I couldn't figure out, such a long
14 discussion that I couldn't figure out from a table or
15 something else whether all of these numbers, Charpy
16 values, which don't look like the numbers in this
17 table, meet some criterion or not.

18 MR. MITRA: We might take action to
19 include this table in the SER.

20 MR. MEDOFF: Those numbers are pulled out
21 from the SER.

22 MR. MITRA: Yes, but we don't have the
23 table in the --

24 MEMBER WALLIS: It says something should
25 exceed 50 foot pounds or is it supposed to be less

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1 than or more than? It says, "It should exceed 50 foot
2 pounds." Is that right?

3 MR. MEDOFF: No. In the SER, it clearly
4 clarifies what the requirements are in appendix G and
5 what you're supposed to do if you fall below that. I
6 have a regulatory base --

7 MEMBER WALLIS: It should exceed 50 foot
8 pounds. Is that right?

9 MR. MEDOFF: Right. But if you fall below
10 50 foot pounds, what the rule requires you to do is do
11 an equivalent margins analysis to demonstrate
12 acceptable levels of upper shelf energy.

13 MEMBER WALLIS: Which seems to be much
14 lower values.

15 MR. MEDOFF: Right. It would be lower
16 than 50 foot pounds at the end of the extended --

17 MEMBER WALLIS: A lot lower, right? A lot
18 lower? It's talking about 29, 30, 35, something. I
19 just don't understand why it's all okay.

20 MR. MEDOFF: The 50 foot pound value is
21 based on linear-elastic fracture mechanics. Once you
22 fall below it, there are alternative fracture
23 toughness assessments, specifically elastic plastic
24 fracture mechanics, evaluations that they can use to
25 show equivalent safety margin.

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1 MEMBER WALLIS: And it's so arcane that I
2 can't understand it.

3 MR. MEDOFF: The materials aren't here.

4 MEMBER SHACK: Well, I mean, you have to
5 go through the fracture mechanics analysis, you know,
6 but you postulate your big flaw and then you
7 demonstrate that you, in fact, can sustain that. But
8 it's sort of not intuitively obvious.

9 MEMBER WALLIS: That's right. It wasn't
10 clear by what criterion the staff accepted these
11 values that they came up with.

12 MR. MEDOFF: It should be in the SE, but
13 I can point it out to you or we can revise the SE to
14 make it clearer.

15 MEMBER WALLIS: Maybe you can make it
16 clearer somehow. So that is quite different from this
17 table we're looking at here. This is something else.
18 And this quarter, the RTndt, what's that?

19 MR. MEDOFF: The RTndt, the boilers have
20 submitted during the current term certain leave
21 requests to eliminate certain inspections of their
22 circumferential wells in their reactor vessel.
23 They're based on probablistic fracture mechanics
24 assessments that were developed by the BWRVIP, which
25 were documented in the BWRVIP-05 report.

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1 The staff reviewed that report and
2 improved the probablistic fracture mechanics methods
3 for the fleet and came up with limiting probability of
4 failure values for both the circumferential welds and
5 axial welds in the reactor vessel. And then they
6 developed corresponding adjusted reference
7 temperatures, maximum adjusted reference temperatures,
8 for the vessel materials that would correspond to
9 those probabilities of failure.

10 MEMBER WALLIS: Your conclusion is that
11 they meet the --

12 MR. MEDOFF: As long as they're --

13 MEMBER WALLIS: -- correspondence with a
14 big margin.

15 MEMBER SHACK: Again, the upper shelf is
16 sort of toughness at high temperature. The RTndt is
17 initiation embrittlement, just like the --

18 CHAIRMAN SIEBER: Brittle fracture, yes.

19 MEMBER SHACK: So they're looking at both
20 ends of it and meeting it.

21 MEMBER BONACA: This is the first time
22 I've seen negative --

23 MR. MEDOFF: The probability of --

24 MEMBER WALLIS: Okay. I think it just
25 needs to be clearer in the document.

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1 MR. MEDOFF: Well, we'll go through it.

2 MR. MAURICE HEATH: All right. We'll go
3 on. Section 4.3, "Metal Fatigue." What I wanted to
4 do is just highlight one of the TLAA's: reactor
5 coolant environment on fatigue life of components and
6 piping. Due to the staff's review, the applicant
7 enhanced the fatigue-monitoring program to monitor
8 fatigue for each of the six locations identified in
9 NUREG 62.60. That's applicable to older GE plants and
10 considering reactor water environmental effects.

11 The applicant performed a refined fatigue
12 analysis based on data collection from cycle
13 evaluation module and finite element analysis from
14 fatigue-monitoring program to show CUF, the cumulative
15 usage factor, will remain below the ASME code limiting
16 value.

17 The staff found applicant's assessment
18 acceptable in accordance with 10 CFR 54.21(c)(1)(ii).

19 MEMBER SHACK: Just clarify for me, is
20 this a requirement in the new GALL that they do this
21 now finally or is this still something you negotiate
22 on a case-by-case basis?

23 DR. CHANG: Ken Chang on the staff.

24 In the new GALL, it is clearly stated the
25 6260 -- normally it's 6 or 7 locations -- is at a

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1 minimum. In establishing those six locations, safety
2 has been taken into consideration. So these locations
3 are of safety importance. You don't take like a
4 pressurizer support skirt into consideration. Those
5 are of no safety significance.

6 And also this is the minimum, six or seven
7 locations. Normally applicants can select more than
8 those locations. In this plant, it did select more
9 locations for monitoring. It could be up to 11.

10 So originally they have five locations.
11 And due to the audit, the auditing recommended and
12 requested that, hey, explain why you are using like
13 five of your locations and the GALL recommended, 6260
14 recommended, six locations everybody knows.

15 The applicant agreed to include in their
16 monitoring program, fatigue monitoring program, all
17 the 6260 locations. Some of them may be the same as
18 the five they originally monitored, so up to 11 but
19 could be as minimum as 6.

20 MR. GILLESPIE: But, Ken, Dr. Shack asked
21 a question. Is this now in GALL?

22 DR. CHANG: It is in GALL.

23 MR. GILLESPIE: I just wanted to make sure
24 that no, we're not negotiating this separately every
25 time, which is why you are seeing fewer RAIs and

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1 hopefully you will see fewer in the future.

2 CHAIRMAN SIEBER: The answer is yes.

3 MEMBER WALLIS: Now, is this fatigue due
4 to pressurizing and depressurizing the system? Is
5 that what it is or is it fatigue due to something
6 shaking or is it fatigue due to thermal changes or --

7 DR. CHANG: Mostly thermal.

8 MEMBER WALLIS: Mostly thermal. It's not
9 just the pressurizing --

10 CHAIRMAN SIEBER: Part of shutdown.

11 DR. CHANG: Now, this fatigue analysis is
12 in the ASME. Currently we call ASME fatigue analysis.

13 MEMBER WALLIS: Like flows in and out of
14 the pressurized --

15 DR. CHANG: Oh, yes. Those are the PWR
16 cases.

17 MEMBER WALLIS: Yes.

18 DR. CHANG: In the BWR cases, you probably
19 are looking at the feedwater nozzles. Those are
20 equivalent to the PWR's pressure research line.

21 MEMBER WALLIS: So this is all metal
22 fatigue we're talking about?

23 DR. CHANG: Yes. This is all metal
24 fatigue. Yes, you can say that.

25 MEMBER SHACK: But driven mostly by

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1 thermal.

2 MEMBER WALLIS: So what do you do with
3 vibration fatigue? I mean, something like vibrating
4 separators or something, --

5 DR. CHANG: Yes.

6 MEMBER WALLIS: -- what do you do about
7 that? How do you know what the cycling load is?

8 MR. GILLESPIE: We had that issue, if you
9 remember, at Dresden/Quad Cities because of the power
10 uprate. And they had extensive vibrations down the
11 whole main steam line. And in that case, now we're in
12 negotiating space because GALL doesn't cover this.

13 In that case, the licensee agreed with the
14 staff, not just for license renewal purposes, but they
15 were instrumenting the entire line to try to get some
16 data on what they had to do relative to dampening that
17 vibration.

18 I think that was a commitment for like a
19 one-year program at the time. I remember they came
20 and discussed that with the committee.

21 MEMBER WALLIS: This is also after the
22 fact, after you find that something is shaking. Then
23 you start to investigate.

24 MR. GILLESPIE: At Dresden/Quad, it was
25 after the fact. I hope we and the utilities are now

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1 smart enough for the next round of things.

2 CHAIRMAN SIEBER: In that instance,
3 though, it's not clear that the deterioration would be
4 to the piping system. It was knocking the valves
5 apart, --

6 MR. GILLESPIE: Right.

7 CHAIRMAN SIEBER: -- position indicators
8 and --

9 MR. GILLESPIE: Fundamentally the analysis
10 wasn't refined enough to have seen the vibration. In
11 the actual as-built situation when they went to the
12 higher flows, --

13 CHAIRMAN SIEBER: Right.

14 MR. GILLESPIE: -- the darned thing had
15 sympathetic vibrations down the whole steam line right
16 to the turbine. So we were unable mathematically to
17 predict it. So the staff took action on it. I mean,
18 clearly if we could predict it up front, I think you
19 would find the staff taking action.

20 So yes, that is a case by case. And that
21 is one of the sensitivities of power uprates.

22 DR. CHANG: In special cases, the ASME
23 code, the fatigue curve, has modified in history. It
24 used to be the fatigue curve goes up to 10^6 cycles.
25 Now the fatigue curve goes to the 10^{11} cycles.

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1 Why do that? The purpose is to address
2 the high-cycle fatigue, high-cycle, low-amplitude
3 fatigue. If you have a case like that, then it
4 depends on you measure the vibration frequency and
5 amplitude.

6 You can address that's how many years to
7 get a failure. If under that 10^{11} cycle, we call it
8 under the induced limit. And those loadings,
9 vibration loadings, will not cause failure until the
10 ASME code changed again.

11 MEMBER WALLIS: You must have low
12 amplitude, too.

13 DR. CHANG: Yes. I did say "amplitude,"
14 frequency and amplitude.

15 MEMBER WALLIS: We know that these steam
16 lines are vibrating. Any idea about the amplitude and
17 what governs it?

18 DR. CHANG: Say the amplitude and
19 frequency depend on the configuration. You put
20 certain frequency there. No. The piping span has
21 certain frequency. And the measurement and monitoring
22 will give you the amplitude.

23 You plug this in there. You see a single
24 span, single span but it would be the maximum strength
25 in a span. And that you show, that stress, is under

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1 the endurance limit. You're okay.

2 MEMBER WALLIS: Well, I was just wondering
3 if you know enough to input the right thing into your
4 analysis.

5 DR. CHANG: That's where experience
6 counts.

7 MEMBER SHACK: Most of those you're not
8 going to analyze up front. You know, you're --

9 CHAIRMAN SIEBER: Yes. It will break.
10 And then you analyze it.

11 MEMBER SHACK: It comes after you go out
12 and you make the measurements and you find out that
13 you've got the problem. You can then sort of decide
14 how bad it is.

15 MEMBER WALLIS: That's what concerns me.
16 So you're not giving us sort of assurance by this
17 slide that there's not going to be any problem of
18 vibrations leading to fatigue?

19 CHAIRMAN SIEBER: No.

20 MEMBER WALLIS: No? You're saying that
21 they do, then? What are you giving the credit for
22 here: analyzing the things they could analyze and
23 being within the code?

24 MEMBER SHACK: These are sort of analyzing
25 the thermal fatigue problems they know they have --

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1 MEMBER WALLIS: They know about. Okay.

2 MEMBER SHACK: -- and making sure that
3 that analysis remains valid for the life of it. You
4 know, the fatigue problems they have that they don't
5 know about they haven't analyzed.

6 DR. CHANG: And those, back to the fatigue
7 problem, it is most likely going to be discovered by
8 walk-down, including --

9 CHAIRMAN SIEBER: Yes.

10 MR. GILLESPIE: Again, getting back to
11 Dresden/Quad because that was one if you walked onto
12 the turbine deck before they did the upgrade and
13 increased flows and after, the noise was horrendous
14 after.

15 So it's not just walking down looking at
16 passive pipe. When you change, physically change, the
17 plant, that's when you're going to find out. And
18 that's what our experience is.

19 And the mathematical models aren't as
20 perfect as we would like to think they are when you
21 try to put in the pipe hangers and stuff. It's not
22 that exact.

23 CHAIRMAN SIEBER: But from a calculational
24 standpoint, it is far easier to look at thermally
25 induced fatigue, --

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1 MR. GILLESPIE: Yes.

2 CHAIRMAN SIEBER: -- which is a low-cycle
3 fatigue, than it is to try to find the resonance point
4 of some complex mechanical system, which I think is
5 really tough to do.

6 MR. GILLESPIE: Now, in Brunswick's case,
7 we could ask the licensee, did they see anything after
8 they uprated because they are a power uprated plant.

9 CHAIRMAN SIEBER: Yes.

10 MR. GILLESPIE: I think the answer is no,
11 there was no abnormal condition that was seen at
12 Brunswick, but let's have the applicant because that
13 will address your specific problem.

14 MEMBER WALLIS: Some of those uprates have
15 only been in effect for a short while.

16 MR. GILLESPIE: It didn't take long to --

17 MR. GRANTHAM: This is Mark Grantham.

18 We did instrument main steam and feedwater
19 lines inside primary containment as well as our MSIV
20 pit. And there were some very slight increases in
21 vibration level, but they were very --

22 MEMBER WALLIS: You have accelerometers or
23 something on there?

24 MR. GRANTHAM: Yes, that is correct.

25 There were minor increases and well within allowables.

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1 MEMBER WALLIS: So this is what is going
2 into this fatigue monitoring program? One of the
3 inputs is the accelerometer readings from the steam
4 lines? Is it? It's not?

5 CHAIRMAN SIEBER: No.

6 MEMBER WALLIS: I'm just not quite sure
7 how the staff satisfies itself that everything is okay
8 enough.

9 MR. GILLESPIE: Let me ask the licensee
10 because it may not be. Your statement I think was
11 that this was within allowables that you just made on
12 the accelerometers?

13 MR. GRANTHAM: That is correct.

14 MR. GILLESPIE: Okay, which means it's
15 encompassed in the uncertainties and considerations of
16 the calculation.

17 MR. GRANTHAM: What we did was we went
18 back and did a pipe stress analysis based on certain
19 displacements and vibration and based on the
20 allowables within the code determined what acceptable
21 levels were.

22 MR. GILLESPIE: So I just don't want it to
23 go on record that this was ignored. It wasn't
24 ignored. It's actually encompassed in the analysis in
25 the allowables and uncertainties within the analysis

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1 already.

2 So the staff finding is that what they're
3 doing is acceptable. It wasn't ignored.

4 MEMBER WALLIS: That's what I'm trying to
5 determine. That's all.

6 MR. GILLESPIE: We needed the dialogue to
7 do that.

8 CHAIRMAN SIEBER: Okay. Moving on.

9 MR. MAURICE HEATH: All right. Moving on
10 to section 4.4, "Environmental Qualification, EQ, of
11 Electrical Equipment," the applicant's EQ programs
12 consistent with GALL AMP, X.E1, "Environmental
13 Qualification of Electrical Components," operating
14 experience identified no age-related equipment
15 failures that its program is intended to prevent. The
16 staff concluded that the effects of aging or the
17 intended function will be adequately managed for the
18 period of extended operation.

19 Section 4.6, I want to highlight two
20 TLAA's: the torus downcomer/vent header fatigue
21 analysis and the torus, attached and safety relief
22 valve piping system fatigue analysis. The staff found
23 that the staff accepted the evaluation in accordance
24 with 10 CFR 54.21(c)(1)(ii).

25 MEMBER WALLIS: Now, this fatigues because

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1 they test these from time to time or from time to time
2 a relief valve is open and there is shaking in the
3 torus downcomer? Is that what has happened?

4 MR. MAURICE HEATH: Ken?

5 MEMBER WALLIS: What is it that challenges
6 this fatigue? What is it that causes the fatigue?

7 DR. CHANG: This is Ken Chang again.
8 Speaking of this SRV piping system that is subject to
9 the dynamic loading, those loadings can be determined.
10 And then you can go into the stress calculation,
11 evaluate stress level in the piping, and compare it to
12 the ASME allowable in primary, secondary, and fatigue
13 limits. That's what they mean.

14 MEMBER WALLIS: It gets pretty exciting,
15 doesn't it, when you blow steam into the torus?

16 DR. CHANG: Oh, yes. That's lots of
17 paper, publication that has generated over like ten
18 years ago, traced back many, many years.

19 MEMBER WALLIS: So that's what you're
20 calculating based on data you're calculating these
21 loads?

22 DR. CHANG: That can not be experienced
23 because that is a horrible experience.

24 CHAIRMAN SIEBER: You only do it once.

25 MR. MAURICE HEATH: Section 4.7, "Other

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1 Plant-Specific TLAAs," I wanted to highlight one in
2 particular: torus component corrosion allowance, the
3 component supports classified as ASME section XI,
4 "In-service Inspection Supports," and non-ASME section
5 XI, "ISI Supports."

6 The staff needed additional information on
7 calculations for corrosion rates for the ASME
8 components and clarification on the one-time
9 inspection program for the non-ASME ISI supports.

10 In letter dated March 31, 2005, the
11 applicant presented calculations for corrosion rates
12 and descriptions on one-time inspection program for
13 non-ASME ISI supports.

14 The staff accepted the evaluation in
15 accordance with 10 CFR 54.21(c)(1)(ii).

16 MEMBER SHACK: What's an ASME support and
17 the non-ASME support?

18 MR. MAURICE HEATH: I'll defer to Hans
19 Asher to answer that question for you.

20 MR. ASHER: My name is Hans Asher.

21 Inside the torus, there are two types of
22 supports. One is ASME. Those are bearing the low
23 pressure-containing components. They are all ASME
24 components. But then there are certain supports which
25 are like a structure supporting the grading or some

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1 other non-safety-bearing --

2 MR. MAURICE HEATH: Did that answer your
3 question?

4 (No response.)

5 MR. MAURICE HEATH: All right. For a
6 summary for section 4, the TLAA, according to the
7 definition in 10 CFR 54.3, the TLAA list, as amended,
8 was found adequate by the staff. And each TLAA met
9 one of the definitions of 10 CFR 54.21 (c)(1)(i),
10 either (i), (ii), or (iii).

11 And, with that, I would like to conclude
12 the staff's presentation and ask if there are any more
13 questions.

14 MEMBER BONACA: There were no (iii)'s,
15 right?

16 MR. MAURICE HEATH: No. There were
17 (iii)'s.

18 MEMBER BONACA: There were (iii)'s?

19 MR. MAURICE HEATH: In the metal fatigue
20 portion.

21 MEMBER BONACA: Yes.

22 MR. MAURICE HEATH: They did a calculation
23 60-year to show that to the extended period of
24 operation.

25 MEMBER BONACA: That reply means that you

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1 will manage the problem.

2 MR. MAURICE HEATH: I'm sorry. Yes.

3 That's what fatigue monitoring programs are.

4 MEMBER BONACA: Okay. I didn't see those.

5 MR. MAURICE HEATH: Right.

6 MR. MITRA: That concludes our
7 presentation.

8 CHAIRMAN SIEBER: Yes. Are there any
9 other questions from members?

10 MEMBER WALLIS: So if something goes wrong
11 with the intended function, then we say you guys
12 didn't anticipate it in your review or we simply say
13 that it's okay because it's being properly managed and
14 it's going to be found and it's going to be cured?

15 You were interested in the management of
16 it, not in trying to predict that there won't be any
17 problems? You're just saying that they had the
18 problem system set up so that they can manage the kind
19 of problems that might arise?

20 MR. MAURICE HEATH: Yes. That is correct.

21 CHAIRMAN SIEBER: Any other questions or
22 comments?

23 (No response.)

24 SUBCOMMITTEE DISCUSSION

25 CHAIRMAN SIEBER: Well, according to the

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1 agenda, our next step is to have a Subcommittee
2 discussion. To my viewpoint, the discussion focuses
3 on whether the full committee should write an interim
4 letter or not on the safety evaluation in the
5 application and the applicant's and staff's activity
6 so far in the review process.

7 Generally interim letters are written if
8 there are significant issues that arise that appear to
9 be taking a direction which would differ from ACRS'
10 view of the final condition of the SER when the
11 license extension is granted.

12 So what I would like to do is to go around
13 the table and ask members, first of all, should we
14 write an interim letter. And if we do, what should be
15 the topics and issues that would be in that letter.

16 And then beyond that, I would be
17 interested in knowing your overall assessment and
18 comments as to individual items within both the
19 application and the SER in today's presentations.

20 So, with that, I would like to ask Dr.
21 Shack those questions and hear his comments.

22 MEMBER SHACK: Well, you know, since the
23 staff has no open issues, I don't see any showstoppers
24 here. So I don't see any particular need for an
25 interim letter. The application seems like a fairly

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1 good one. I don't see any real problems.

2 CHAIRMAN SIEBER: Okay. That's good
3 because if there were an interim letter, I would have
4 to write it tonight.

5 (Laughter.)

6 CHAIRMAN SIEBER: Okay. Dr. Wallis?

7 MEMBER WALLIS: Yes. I don't think we
8 need an interim letter. This SER actually is fatter
9 and more extensive, I think, than some of the others
10 we have seen at this point in time, from license
11 renewal.

12 What I have been missing is sometimes a
13 clarification at the end of a discussion about why the
14 issue is resolved or why the evidence as presented
15 meets some criterion. I think that can be fixed up in
16 looking at the SER.

17 I mean, you can write it for the reader
18 when you have 20 pages of discussion about Charpy
19 being all these different numbers. I mean, why is it
20 that you conclude that everything was okay? That's
21 the kind of thing that I was after in my questions.

22 I think the substance is there, but it
23 needs to be presented in a way which is absolutely
24 clear why you reached the conclusion that everything
25 was okay.

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1 MR. MITRA: We will take a look at the --
2 we took note that you have described. And we will
3 take a look at it and try to revise it.

4 CHAIRMAN SIEBER: Dr. Bonaca?

5 MEMBER BONACA: Yes. I second the
6 comments of Graham.

7 CHAIRMAN SIEBER: Okay.

8 MEMBER BONACA: It's a common experience.
9 I mean, the SER seems to serve a lot of purposes. One
10 of them is to document all the exchange and
11 interaction with the licensee. The result of it is
12 that for a reviewer, like ourselves, at times you have
13 to really go through until you find the conclusions of
14 what you are looking for. And at times, it gets
15 confusing more or less.

16 But with regard to this application, I
17 think it was a very good application. It was very
18 clear. And I think the SER also was thorough and
19 complete.

20 I had the same trouble a little bit with
21 TLAA because there was so much write-up and
22 considerations. And, again, in search of the
23 concluding statement, it was not easy.

24 Yes?

25 MEMBER SHACK: I was just going to say

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1 part of the problem is that, you know, these things
2 are now so linked and so documented you sort of have
3 to know the whole history of things.

4 I sort of sat there deciding why it was
5 okay they didn't have to commit to a hydrogen water
6 chemistry in the license renewal. Well, then that
7 shifted me to their BWR SEC corrosion program. And
8 then that shifted me to the BWRVIP-76, which sort of
9 said, you know, if you had the hydrogen water
10 chemistry, you wouldn't have this much inspection, but
11 if you turned off the hydrogen water chemistry, they
12 were still covered because the BWR-76 would throw them
13 into a new inspection program.

14 And somehow you have to just keep chasing
15 down the thing. So the trail, it isn't as though the
16 license renewal stands on its own anymore. It's
17 infinitely linked.

18 MEMBER BONACA: Well, it's more of the
19 complexity of our review because we discussed this at
20 our retreat. I mean, it's how do you make it more
21 efficient when you have to chase all of these issues,
22 in fact? In some cases, I'm still puzzled about some
23 of the responses I got.

24 But going back to the application, I think
25 it was very good. SER 2 I am supportive of the fact

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1 that there are no open items. So I don't see any need
2 for an interim letter at this time. And, in fact, I
3 would expect that this will come back pretty soon for
4 final review --

5 CHAIRMAN SIEBER: I would think so.

6 MEMBER BONACA: -- because of the
7 condition of this application and the SER. So I have
8 no further comments.

9 CHAIRMAN SIEBER: Otto, do you have any
10 comments? It's sort of unfair to ask you because you
11 haven't had the luxury of time like the rest of us
12 have had.

13 MEMBER MAYNARD: Well, I'm not officially
14 on this Subcommittee yet, but I'll offer opinions
15 anyway.

16 CHAIRMAN SIEBER: I have never prevented
17 anyone else from doing that.

18 (Laughter.)

19 MEMBER MAYNARD: As I understand the
20 criteria, I wouldn't see a need for an interim letter
21 on this one.

22 I don't have much of a reference point.
23 I haven't had a lot of time looking at this or looking
24 at others. But I would say that just from the overall
25 thoroughness of the report and the lack of a lot of

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1 open items and open issues, that it would appear to me
2 that both the utility and the NRC have been learning
3 as this process has gone along, taken advantage of it.
4 It's a good product overall.

5 CHAIRMAN SIEBER: My overall impression,
6 by the way, is that as time goes on and more and more
7 license renewal applications and SERs are written has
8 a tendency to come to -- you know, you say this code
9 word and I will say that code word.

10 It gets to the point I think that it
11 becomes more difficult for the average person or
12 average engineer to read and understand what all these
13 things mean.

14 In the case of Brunswick, there are some
15 unique features about this plant that don't exist in
16 any other plant. In order to evaluate how the
17 licensee treated it and how the staff reviewed their
18 treatment from the standpoint of aging management,
19 some of these unique features, like the containment,
20 you know, almost require the FSAR plus some other
21 access to documents, which basically aren't online.

22 This plant was built in 1970. I think the
23 Radio Shack's TRS-80, which was the first commercial
24 PC, came out seven years later. And so I don't expect
25 to find that on the ADAMS system. On the other hand,

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1 that is available to the staff.

2 My way of doing this was to go through and
3 find the unique features and things I didn't know
4 about, make a list of questions, and then prompt the
5 licensee and the staff to the fact that I had
6 questions that they ought to address in this
7 presentation.

8 I agree with my colleagues that we don't
9 need an interim letter. This was a good SER. It was
10 a good clean application or appears to be good
11 cooperation between the applicant and the staff at
12 resolving issues.

13 That's why there are no open items, a
14 modest, relatively speaking, number of RAIs. And I
15 think the process is maturing and the staff is getting
16 more efficient at being able to conduct their reviews,
17 turn out a good solid SER in the process.

18 In the design process if I were the
19 designer back 30 or 40 years ago, which I was, but
20 designers design little pieces of things, as opposed
21 to gigantic things, especially when you're in your 20s
22 and 30s age-wise, there are some things I might have
23 done differently. On the other hand, the design does
24 work.

25 The aging management that the licensee is

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1 conducting appears to satisfy the requirements. And
2 with all the commitments that have been made, I think
3 that one can conclude the plant will be safe for the
4 extended period of operation.

5 So overall those are the conclusions that
6 I came to. I appreciate the fact that I don't have to
7 write an interim letter tonight as a draft. On the
8 other hand, you never know. Maybe when the full
9 committee hears my presentation tomorrow, I will end
10 up writing an interim letter. One never knows.

11 What I would like to do is to thank the
12 applicant and the staff for what I think is a job
13 well-done and good preparation and good presentations
14 to us today. And to all the reviewers, I think we're
15 all learning to speak each other's language. Now that
16 again makes it more efficient and understandable for
17 us. And so, with that, I want to offer my thanks to
18 all of you who are here for a good Subcommittee
19 meeting today.

20 If either the staff or the applicant has
21 any comments with regard to our process here or the
22 overall license renewal process or license extension
23 process, I think now would be a good time to do that.

24 Yes, sir?

25 MR. GILLESPIE: Frank Gillespie, NRR.

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1 Some questions came up on the screening
2 process.

3 CHAIRMAN SIEBER: Yes.

4 MR. GILLESPIE: And one of the initiatives
5 the staff has kind of taken on is to do something in
6 screening, smaller effort, but look at the past
7 precedence and our past screening decisions. We are
8 working with Billy Rogers and Greg Galletti, who are
9 two of the team leaders who have been doing the
10 process and to actually try to pull I'll call it a
11 screening database together because the answer I don't
12 think was the right answer you got on the bird screen.

13 We can chuckle about the bird screen, but
14 you put a fan on a pump cooling house because you need
15 ventilation because of that removal purposes during
16 high temperatures, which can cause --

17 CHAIRMAN SIEBER: Birds go and then plug
18 up the --

19 MR. GILLESPIE: Plug up the fan. And so
20 it could actually fail, a system that can fail a
21 safety system. And we didn't give you the safety
22 answer. We shouldn't have said, "Well, that's part of
23 the building."

24 And so we're pulling together this so that
25 we can actually have some guidance for us and the

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1 licensees. And we're kind of doing it as time
2 permits, but maybe by next fall, we might be ready to
3 come and share it with the committee.

4 CHAIRMAN SIEBER: Okay.

5 MR. GILLESPIE: Because what it does is
6 kind of sets a standardization of screening for people
7 much as GALL gives a standardization for technical
8 decision-making. So that's just a small initiative we
9 have got going on. And you will probably hear some
10 things about that in the future.

11 MEMBER WALLIS: I'm glad you brought that
12 up because we get the impression from some of this
13 that the only thing that matters is maintaining a
14 boundary. There were actually heat exchangers and
15 fans that are designed to cool things as well. There
16 is another function besides just maintaining a
17 boundary.

18 MR. GILLESPIE: Yes. And, again, I think
19 the applicant answered that heat exchanger question
20 and why. And every one of these components is kind of
21 a unique reason. And you had to be there when you
22 made that decision to try to rethink it when the
23 committee asks the question on a specific component.
24 So sometimes it appears that we don't have the answer,
25 but hidden in the balls of our notes someplace is that

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1 answer.

2 And standardization of how we do it and
3 how we consider it in sharing that might help bring
4 some more understanding, universal understanding, to
5 that.

6 CHAIRMAN SIEBER: Okay. Good. Thank you.
7 Are there any other comments?

8 (No response.)

9 CHAIRMAN SIEBER: If not, again, I want to
10 thank everyone for the effort it took to prepare the
11 presentations and the work that was done on the
12 application and the SER. And, actually, that makes my
13 job and the committee's job much easier on the work
14 that was professionally done.

15 So, with that, I think that we can adjourn
16 even a few minutes early.

17 (Whereupon, the foregoing matter was
18 concluded at 4:14 p.m.)

19

20

21

22

23

24

25

CERTIFICATE


This is to certify that the attached proceedings
before the United States Nuclear Regulatory Commission
in the matter of:

Name of Proceeding: Advisory Committee on
Reactor Safeguards
Plant License Renewal
Subcommittee

Docket Number: n/a

Location: Rockville, MD

were held as herein appears, and that this is the
original transcript thereof for the file of the United
States Nuclear Regulatory Commission taken by me and,
thereafter reduced to typewriting by me or under the
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foregoing proceedings.

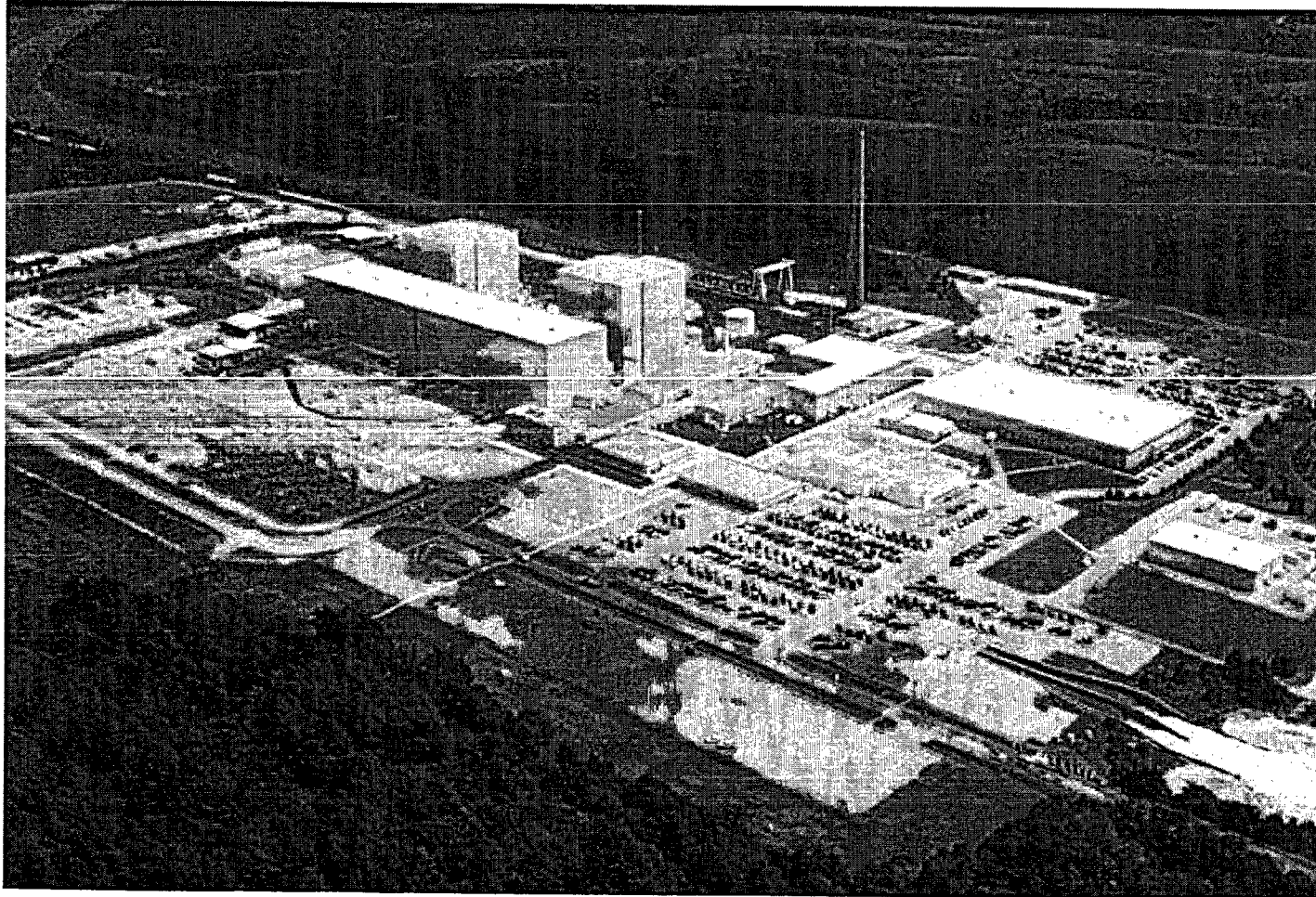


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Brunswick Steam Electric Plant Units 1 and 2



**Brunswick Steam Electric Plant
Units 1 and 2**

License Renewal Presentation to ACRS Subcommittee



Agenda

- Description of BSEP
- Operating History
- Current Plant Status
- Application Background
- LR Review Methodology
- Application of GALL
- Commitment Process

INDEX

Description of BSEP

- Located in Southport, NC
- Cape Fear River is Ultimate Heat Sink
- Dual unit GE BWR 4 with Mark I Reinforced Concrete Containment
- 560 Fuel Assemblies/Unit
- Hydrogen Water Chemistry plant

INDEX

Operating History

- Commercial Operation
 - ◆ Unit 1 March 1977
 - ◆ Unit 2 November 1975
- Current License Expiration
 - ◆ Unit 1 September 2016
 - ◆ Unit 2 December 2014

INDEX

Operating History

- Licensed Thermal Power History
 - ◆ Original licensed thermal power (OLTP)
 - ◆2436 MWt
 - ◆ 105% OLTP Uprate (November 1996)
 - ◆2558 MWt
 - ◆ 120% OLTP Extended Uprate (May 2002)
 - ◆2923 MWt

INDEX

Current Plant Status

- Unit 1
 - ◆ Operating in 15th cycle
 - ◆ Transitioned to 24 month cycles in 1997
 - ◆ Currently Operating at 100% rated power
 - ◆ Will enter a Refuel Outage March 4, 2006

INDEX

Current Plant Status

- Unit 2
 - ◆ Operating in 17th cycle
 - ◆ Transitioned to 24 month cycles in 1997
 - ◆ Currently operating at 100% rated power
 - ◆ Plant issues
 - ◆ White Unplanned Power Changes Performance Indicator

INDEX

Application Background

- LRA used Class of 2003 Format – May 2003
- Information conformed to:
 - ◆ NUREG-1800, SRP-LR, April 2001
 - ◆ NUREG-1801, GALL, April 2001
 - ◆ NEI 95-10, Rev. 3, March 2001
- Information in the LRA was developed in plant calculations

LR Review Methodology

- Scoping
 - ◆ Based on UFSAR, DBDs, Docketed Correspondence
 - ◆ Quality Class Review using Equipment Database
 - ◆ Focused Reviews for Regulated Events and Non safety Impacting Safety
 - ◆ NSR Steam Dryers and NSR Drains in scope
 - ◆ Addressed ISGs 1 through 20
- Aging Management Review
 - ◆ Class of 2003 table format
 - ◆ Provides NUREG 1801 Comparison
- Aging Management Programs
 - ◆ 34 AMPs Identified

INDEX

Commitment Tracking

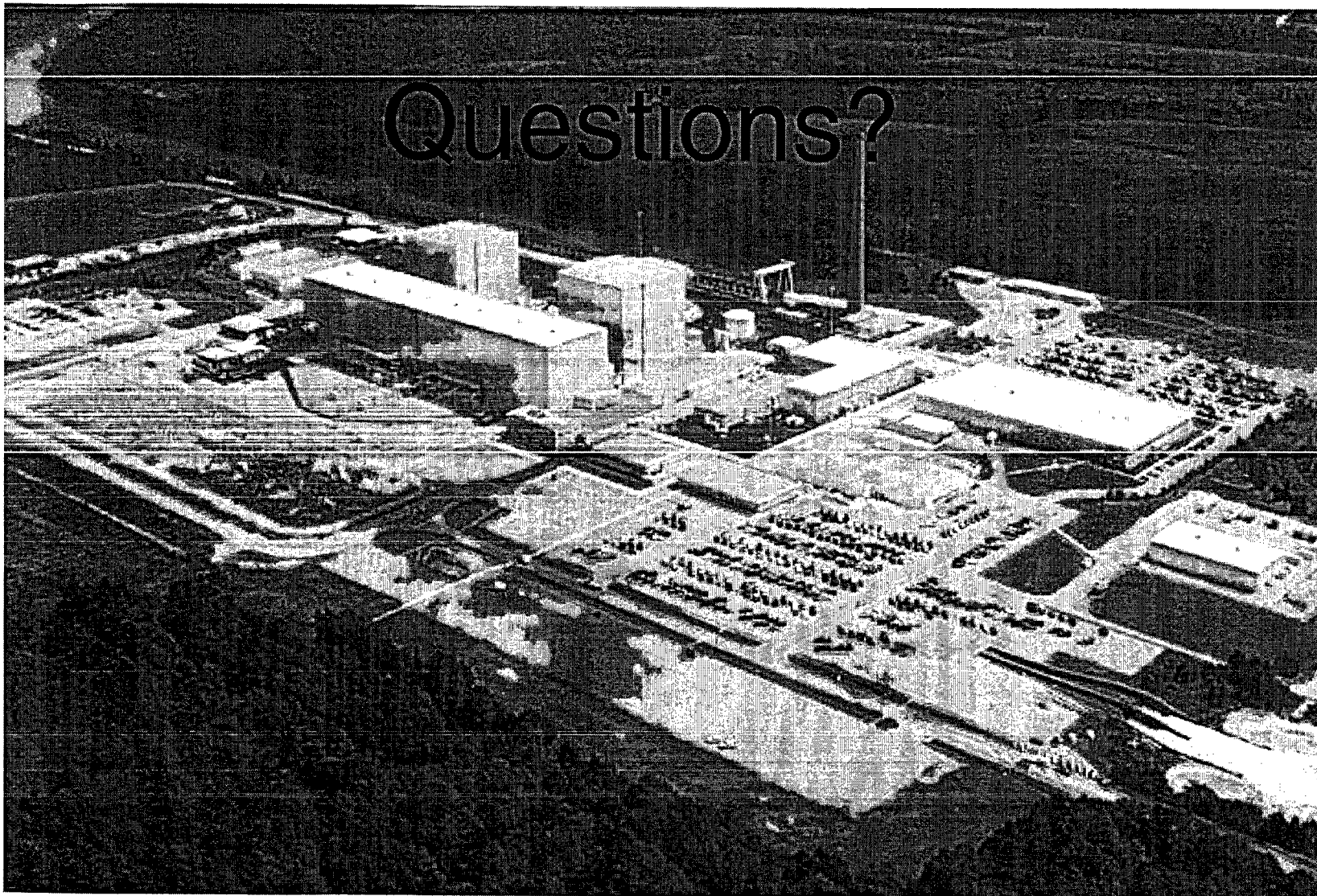
- All Commitments are Tracked by the BSEP Corrective Action Program (CAP)
- Each Commitment Has an Implementation Plan
 - ◆ Each Implementation Plan Identifies all required actions
 - ◆ All actions are linked to the CAP
 - ◆ All actions have a due date and owner
- LR Program Procedure Will Track LR Activities
- Document Updates Scheduled for 2006

INDEX

Conclusion

- The New Audit Process Effective
- Early Identification of Concerns Allowed Early Resolution

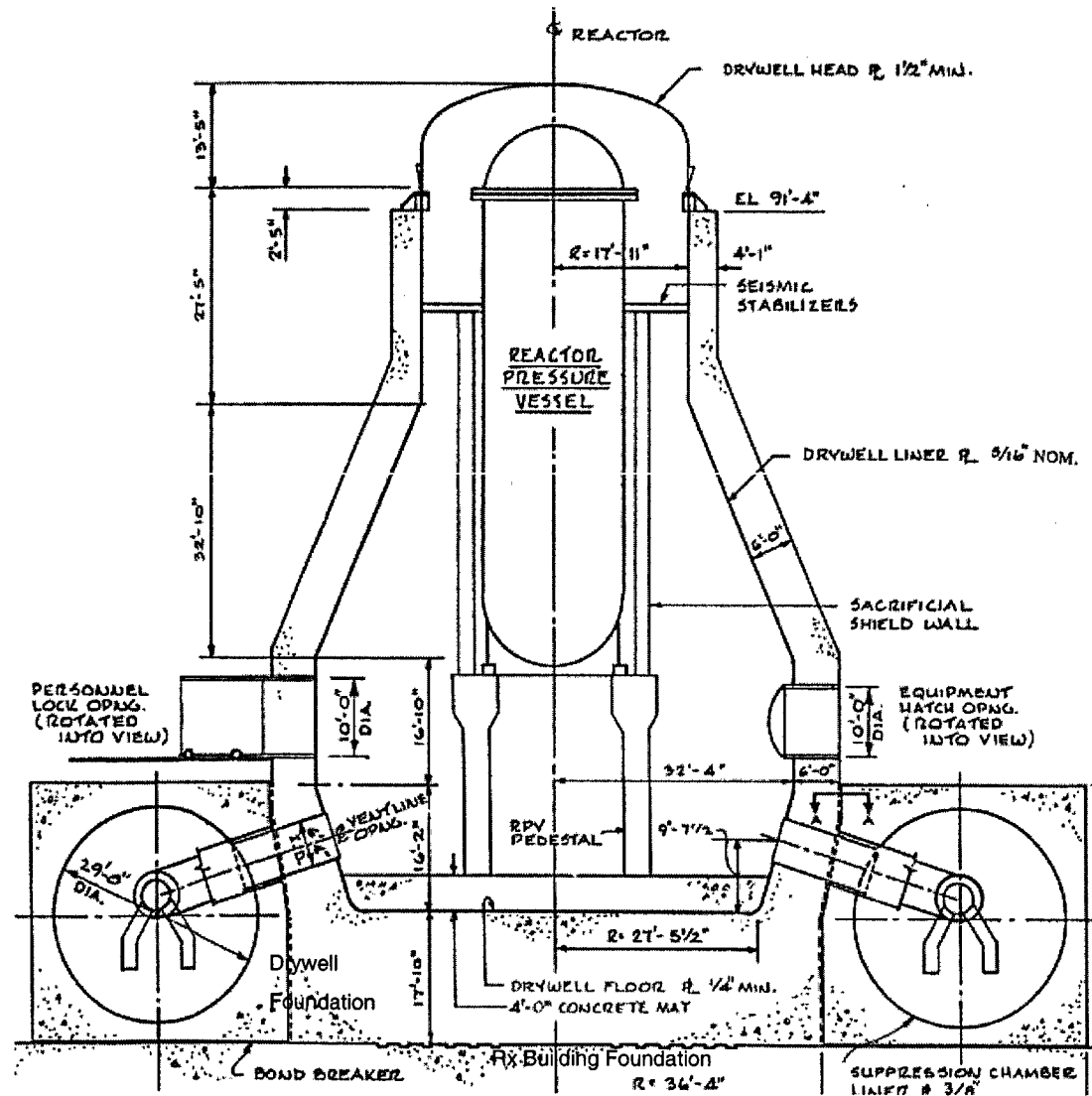
Questions?



INDEX



Mark I Reinforced Concrete Containment



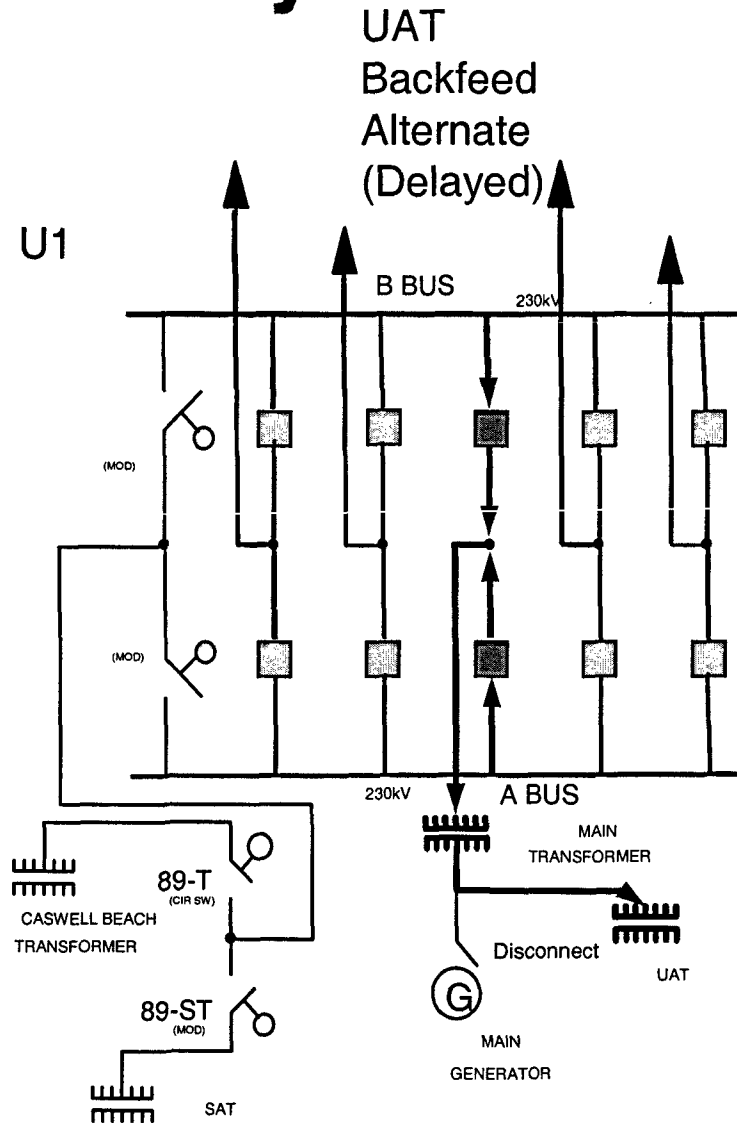
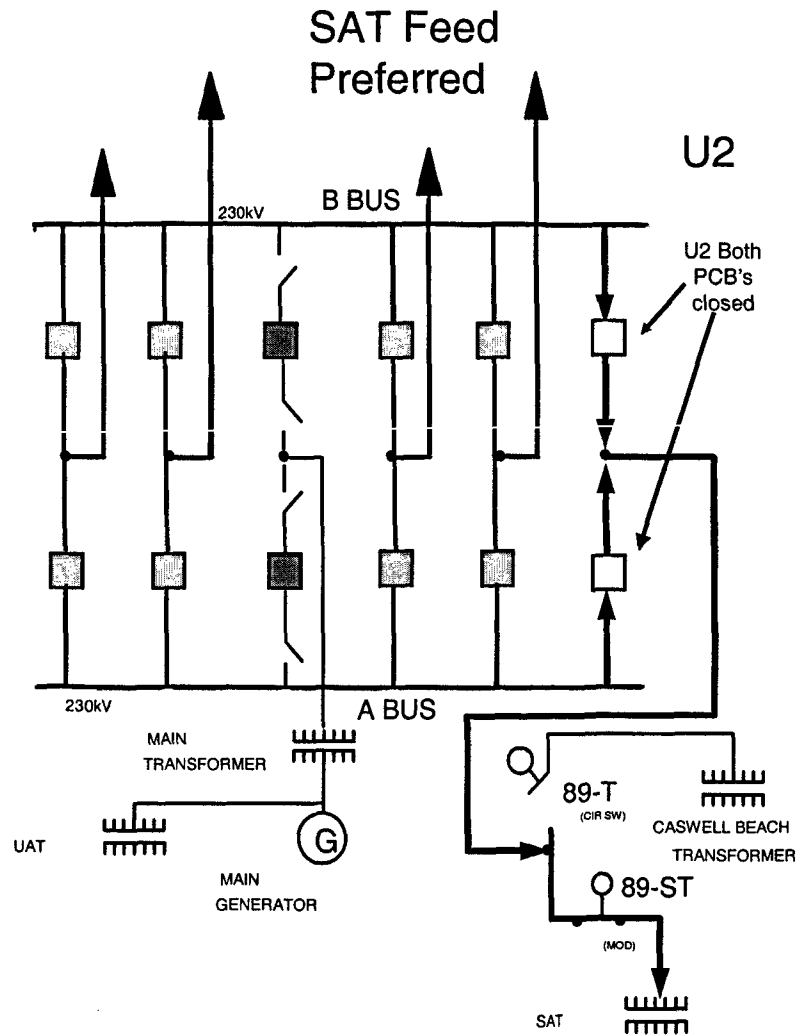
NRC Information Notice 2006-01

BWR Mark I Containment Torus Cracking

- The Brunswick HPCI exhaust:
 - ◆ utilizes a sparger configuration
 - ◆ significantly different from the Fitzpatrick configuration (turned down elbow within 2-1/2 feet of the torus shell).
- The BSEP torus is steel lined, reinforced concrete
- The Fitzpatrick Torus is free standing steel.

INDEX

SBO Recovery



BSEP Steam Dryer Review

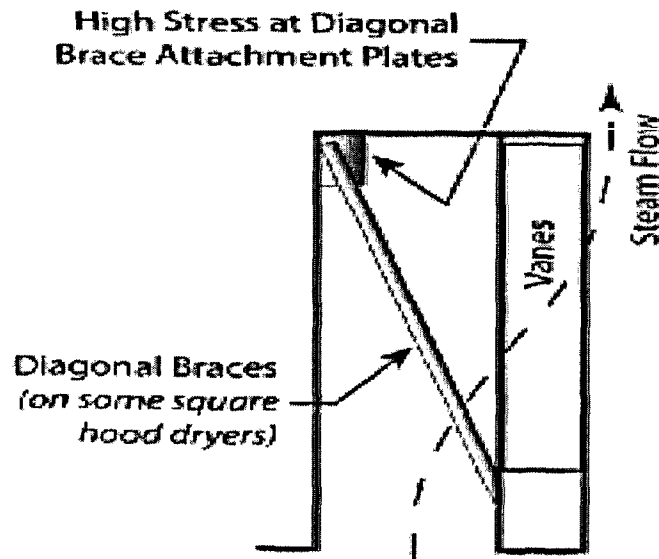


Steam Dryer Background

- BSEP has a BWR-4 slanted hood dryer
 - ◆ Does not include internal diagonal brace attachments
 - ◆ Lower resultant stresses
- BSEP has significantly lower steam line velocities than other dryers damaged post-EPU
 - ◆ BSEP – 146 ft/sec
 - ◆ Damaged dryers post EPU >200 ft/sec
 - ◆ Steam line velocities remain in the middle of the BWR fleet

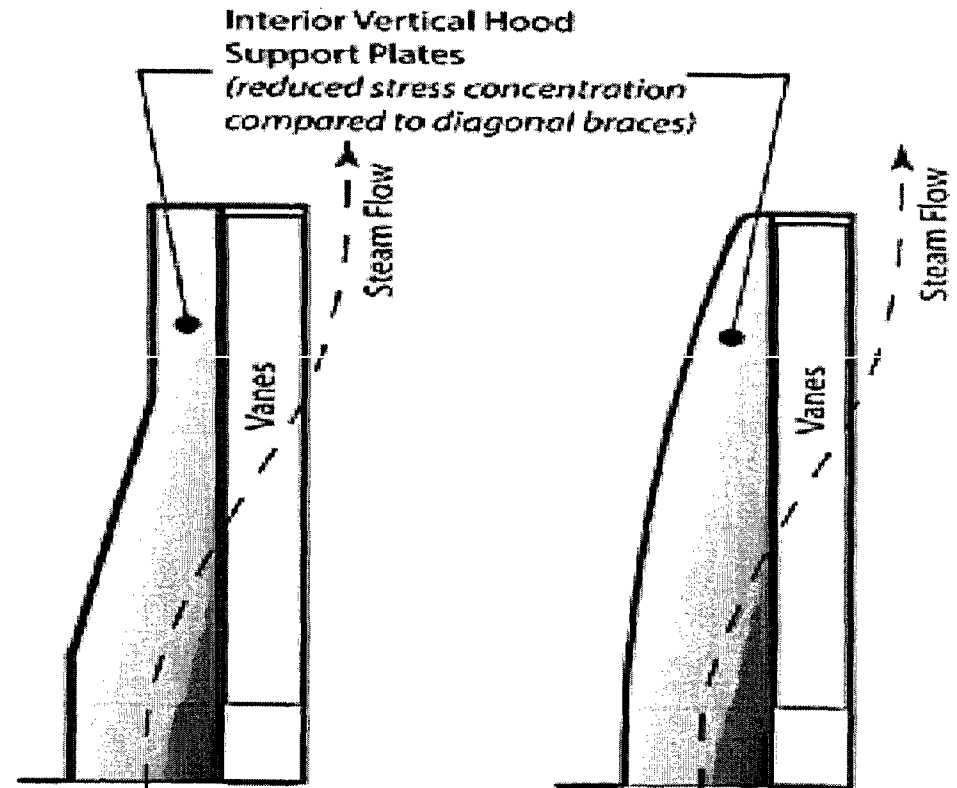
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Steam Dryer Designs



Square Hoods
BWR/3 Style Design

Damaged Dryers
Post EPU



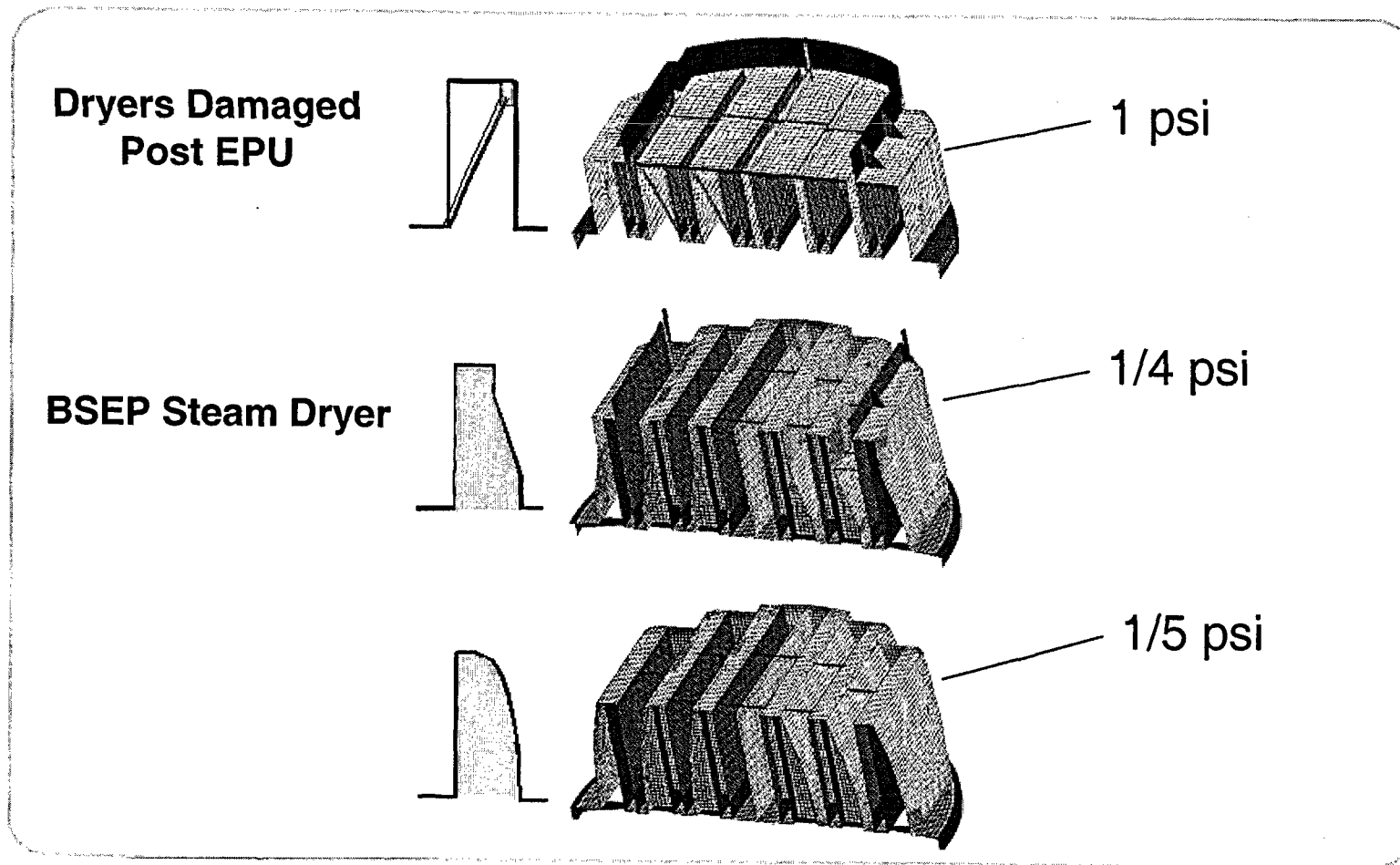
Slanted Hoods
BWR/4 Style Design
Improved Steam Flow

Curved Hoods
BWR/5 Style Design
Optimized Steam Flow

BSEP Steam Dryer

INDEX

Relative Stress on Dryer Hood



BSEP Steam Dryer Inspections

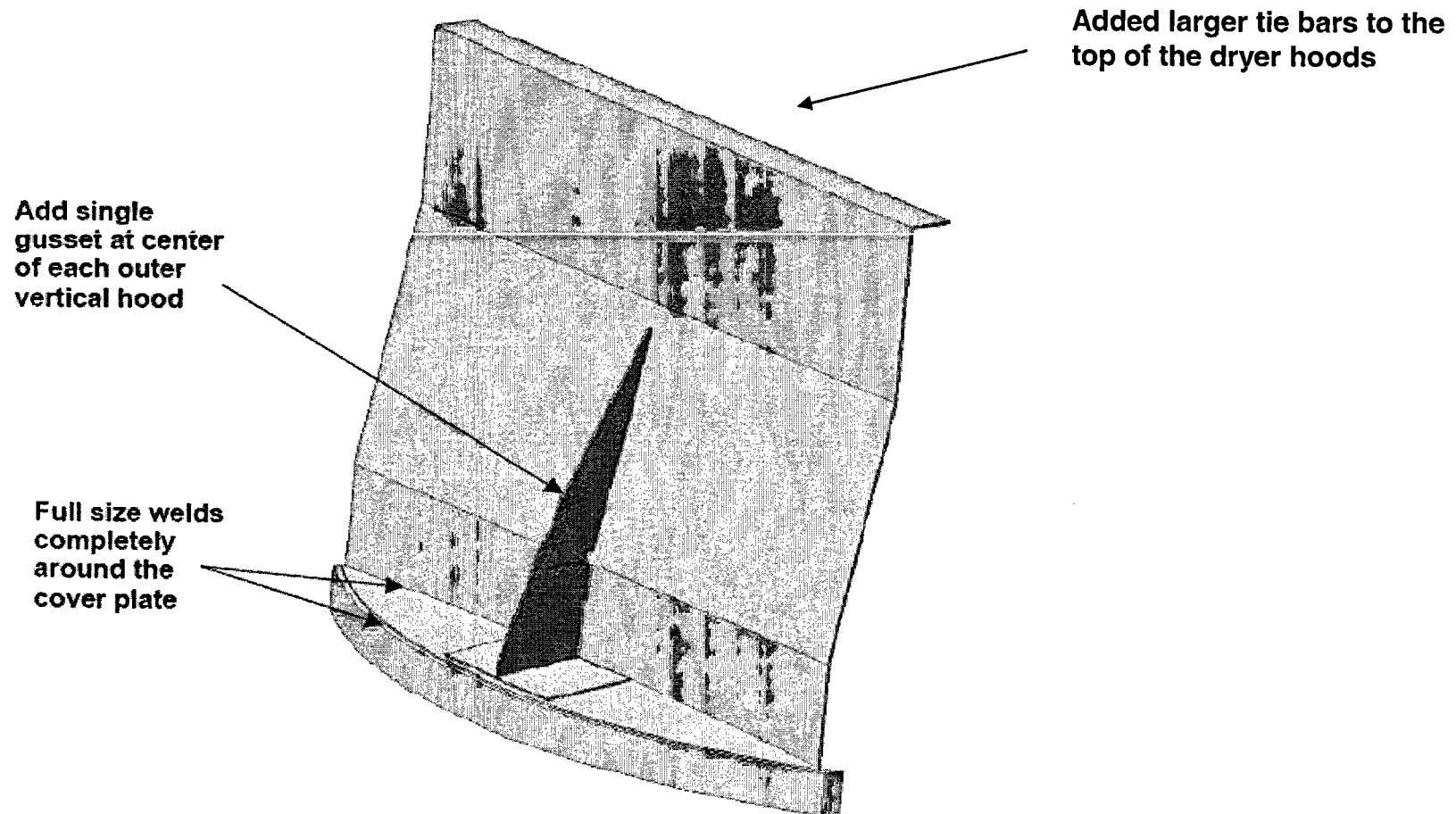
Unit 1

- June 2002 -Uprate to 113% OLTP
- Sept. 2002 – General inspection during mid-cycle outage – No degradation noted
- March 2004 – 100% exterior inspection and dryer modification performed – minor weld repairs
- April 2004 – Uprate to 120% OLTP
- April 2005 – Inspection performed during mid-cycle outage – No new degradation noted
- March 2006 – Planned inspection during refuel outage

Unit 2

- April 2003 – Uprate to 116% OLTP
- March 2005 - 100% exterior inspection and dryer modification performed – minor weld repairs
- April 2005 – Uprate to 120% OLTP
- May 2006 – Planned inspection during mid-cycle outage
- March 2007 – Planned inspection during refuel outage

BSEP Steam Dryer Modifications



INDEX

BSEP Operating Experience with EPU

- Fatigue failure of EHC return line for main turbine control valves
 - ◆ Interim power level was likely a contributor
 - ◆ Industry OE with these types of failure exists
 - ◆ Piping modified to a flexible connection
- Socket welded drain line failures
 - ◆ Previous industry and BSEP OE with these types of failures
 - ◆ Changed socket weld configurations to a more fatigue tolerant design

BSEP Operating Experience with EPU

- Condensate/Feedwater system response
 - ◆ System response during minimum flow valve operation
 - ◆ Higher condensate pressures
 - ◆ Optimization of system operation
- Main generator disconnect switch failure
 - ◆ Switch design did not support the continuous rating
 - ◆ Modified to a hard bus configuration

INDEX

U2 Unplanned Power Changes per 7000 Hours Critical

- Occurrences causing transition to White
 - ◆ April '05 – 2B Reactor Feed Pump Impeller Failure
 - ◆ June '05 – 2B Circulating Water Intake Pump Trip Due to Debris Loading
 - ◆ August '05 – Dual Unit Shutdown Due to Identified Legacy Issue with Diesel Generator Differential Protection Circuit
 - ◆ November '05 – Three Unit Downpowers due to Tube Leaks in the 2A Condenser Water Box
 - ◆ December '05 – 2B Reactor Recirculation Pump MG Set Trip due to Failure of Fuse in the Voltage Regulation Circuit
- NRC Supplemental Inspection February 2006

Index

- | | |
|------------|------------|
| <u>1.</u> | <u>15.</u> |
| <u>2.</u> | <u>16.</u> |
| <u>3.</u> | <u>17.</u> |
| <u>4.</u> | <u>18.</u> |
| <u>5.</u> | <u>19.</u> |
| <u>6.</u> | <u>20.</u> |
| <u>7.</u> | <u>21.</u> |
| <u>8.</u> | <u>22.</u> |
| <u>9.</u> | <u>23.</u> |
| <u>10.</u> | <u>24.</u> |
| <u>11.</u> | <u>25.</u> |
| <u>12.</u> | <u>26.</u> |
| <u>13.</u> | |
| <u>14.</u> | |



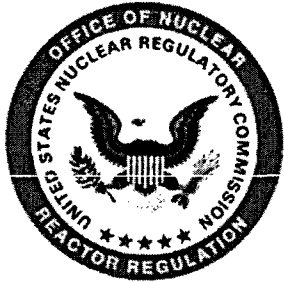
Brunswick Steam Electric Plant (BSEP) Units 1 and 2 License Renewal Safety Evaluation Report

Staff Presentation to the ACRS
Sikhindra (SK) Mitra, Project Manager
Office of Nuclear Reactor Regulation
February 8, 2006



Introduction

- Overview
- NRC Review Process
- Section 2: Scoping and Screening Review
- License Renewal Inspections
- Section 3: Aging Management Review Results
- GALL Review and Audits
- Aging Management Programs
- Section 4: Time-Limited Aging Analyses (TLAAs)



Overview

- LRA submitted by letter dated October 18, 2004
- GE Boiling Water Reactors, Mark 1 design containments
- BSEP located at the mouth of Cape Fear River in Brunswick County, NC, two miles north of Southport, NC
- Unit 1 expires September 8, 2016, Unit 2 expires on December 27, 2014
- Request operating license extensions 20 years beyond the current expiration dates



Overview (continued)

- Each unit generates 2923 MW thermal, 1007 MW electrical – Include 20% Extended Power Uprate (EPU)
- Applicant committed to review plant and industry operating experience, relevant aging effects caused by operation at power uprate. The evaluation will be submitted for NRC review one year prior to period of extended operation (Commitment # 31)



Overview (continued)

- SER issued on December 20, 2005
 - No Open or Confirmatory Items
 - 3 license conditions
 - 174 RAIs issued via 4 letters and 39 Audit questions requiring supplements
 - Brought into scope
 - Switchyard Breakers
 - Service Water Intake structure fan, dampers, bird screen
 - Condensate Storage Tank Piping Credited for SBO



NRC Review Process

- Scoping and Screening Methodology Audit
- Consistency with GALL Audits
 - AMPs
 - AMRs
- Technical staff in-house safety review
- Regional inspections
 - Scoping and Screening Inspection
 - AMP Inspection



NRC Review Process (continued)

- AMP GALL Audit
 - January 10 – 14, 2005
- AMR GALL Audit
 - February 7 – 11, 2005
- Scoping and Screening Methodology Audit
 - February 28 – March 4, 2005
- Regional Scoping and Screening Inspection
 - June 6 – 10, 2005
- Regional AMP Inspection
 - June 20 – 24, 2005



Section 2: Structures and Components Subject to Aging Management Review

- Section 2.1, Scoping and Screening Methodology
 - Staff audit and review concluded that the applicant's methodology satisfies the rule pursuant to 10 CFR 54.4 a and 10 CFR 54.21
- Section 2.2 , Plant Level Scoping Results
 - Staff identified no omission of systems and structures within the scope of the license renewal as defined by 10 CFR 54.4 criterion



Section 2: Structures and Components Subject to Aging Management Review

- Section 2.3, Scoping and Screening Results - Mechanical Systems
 - Reactor Vessel, Internals and Reactor Coolant System
 - Engineered Safety Features
 - Auxiliary Systems
 - Steam and Power Conversion Systems



Two – Tier Scoping Review for BOP Systems

- Two – Tier Scoping Review Based on Screening Criteria
 - Safety Importance/Risk significance
 - Systems Susceptible to Common Cause Failure of Redundant Trains
 - Operating Experience Indicating Likely Passive Failures
 - Previous LRA Review Experience of Omissions
- Tier 1: Screen, Review (LRA, FSAR), Identify Systems for Inspections
- Tier 2: Review (Boundary Drawings, and Other Licensing Basis Documents in Addition to LRA, FSAR)



Two – Tier Scoping Review

- 62 Mechanical Systems
- 39 are BOP (Most Auxiliary and Steam and Power Conversion Systems)
 - 15 BOP Systems Selected for Tier 1 Review
 - 24 BOP Systems Selected for Tier 2 Review
- 23 Mechanical Non BOP Systems (RCS, Engineered Safety Features, Some Aux Systems), Continue to Receive Tier 2 review
- Electrical and Structural Receive Tier 2 review.



Section 2.3, Scoping and Screening Results - Mechanical Systems

- Condensate storage tank piping credited for SBO brought into the scope
- Service water intake structure fan, bird screen and damper housings are brought into scope.



Section 2: Structures and Components Subject to Aging Management Review

- Section 2.4, Scoping and Screening Results – Structures
 - Containment
 - Other Class 1 and in-scope Structures (15)



Section 2: Structures and Components Subject to Aging Management Review

- Section 2.5, Scoping and Screening Results – Electrical and Instrumentation and Control (I&C) Systems
 - Guidance contained in NEI 95-10 Appendix B was used in developing a list of electrical and I&C commodity groups
 - Switchyard breakers (230 kv gas- filled power circuit breakers) represent the first breakers for SBO recovery path are brought into scope of license renewal



Scoping and Screening Summary

- The applicant's scoping methodology meets the requirements of 10 CFR Part 54
- Scoping and screening results as amended included all SSCs within the scope of license renewal and subject to AMR



License Renewal Inspections

- Scoping and Screening Inspection
- Aging Management Inspection
- Commitment Tracking
- Plant Reactor Oversight Process (ROP)



License Renewal Inspection Program Implementation

- License Renewal Manual Chapter – MC 2516
- License Renewal Inspection Procedure – IP 71002
- Site-specific inspection plan
- Scheduled to support NRR safety review



License Renewal Inspections

- Scoping and Screening Inspection
 - Objective: to confirm that the applicant has included all appropriate SSCs in the scope of license renewal as required by 10 CFR 54.4
 - Conducted June 6 – 24, 2005
 - MC 2516 and IP 71002 have been revised to reduce the scope of Scoping and Screening inspections and combine them with Aging Management Program inspections
 - Focus is on 10 CFR 54.4 (a) (2) situations- non safety related that could effect safety related equipment



License Renewal Inspections

- Incorporated 3 - Tier – 1 Scoping Review Inspections
 - Heat Tracing Systems
 - Moisture Separator Reheater Drains and Reheat Steam System
 - Heater Drains and Miscellaneous Vents and Drains
- Concluded that the applicant's scoping and screening process was successful in identifying those SSCs requiring AMR



Aging Management Program Inspection

- Objective: to confirm that existing AMPs are managing current age related degradation
- Applicant established an implementation plan in the plant Action Request system to track committed future actions
- Inspectors found a few examples where actions committed in AMP description documents were not yet in implementation plan.
- Applicant promptly made needed corrections and several changes.
- Material condition of plant was being adequately maintained
- Documentation was of very good quality, supported by a comprehensive computer database



Brunswick, Unit 1

3Q/2005 Performance Summary

Performance Indicators

Unplanned
Scrams (G)

Emergency AC
Power System
Unavailability (G)

Reactor Coolant
System Activity
(G)

Drill/Exercise
Performance (G)

Occupational
Exposure Control
Effectiveness (G)

RETS/ODCM
Radiological
Effluent (G)

Scrams With Loss
of Normal Heat
Removal (G)

High Pressure
Injection System
Unavailability (G)

Reactor Coolant
System Leakage
(G)

ERD Drill
Participation (G)

Unplanned Power
Changes (G)

Heat Removal
System
Unavailability (G)

Alert and
Notification
System (G)

Residual Heat
Removal System
Unavailability (G)

Safety System
Functional
Failures (G)

February 8, 2006

21



Brunswick, Unit 2

3Q/2005 Performance Summary

Performance Indicators

Unplanned Scrams (G)	Emergency AC Power System Unavailability (G)	Reactor Coolant System Activity (G)	Drill/Exercise Performance (G)	Occupational Exposure Control Effectiveness (G)	RETS/ODCM Radiological Effluent (G)
Scrams With Loss of Normal Heat Removal (G)	High Pressure Injection System Unavailability (G)	Reactor Coolant System Leakage (G)	ERO Drill Participation (G)		
Unplanned Power Changes (G)	Heat Removal System Unavailability (G)		Alert and Notification System (G)		
	Residual Heat Removal System Unavailability (G)				
	Safety System Functional Failures (G)				

February 8, 2006



Section 3: Aging Management Review Results

- 3.1, Reactor Vessel, Internals, and Reactor Coolant System
- 3.2, Engineered Safety Features Systems
- 3.3, Auxiliary Systems
- 3.4, Steam and Power Conversion Systems
- 3.5, Containments, Structures and Component Supports
- 3.6, Electrical Components



Aging Management Programs (AMPs)

- Total 34 AMPs
- Consistent with GALL: 9
- Consistent with GALL, with deviations: 20
- Plant Specific: 5



EXAMPLES OF AUDIT AND REVIEW TEAM FINDINGS AND RESULTS

- Originally used Risk Informed ISI program for AMP, ASME Section XI, In service Inspection, Subsections IWB, IWC and IWD Program
 - Modified AMP to be consistent with GALL, ASME Section XI, & 50.55a: added periodic volumetric, surface and visual examinations
- Originally committed to inspect and clean RHR and EDG jacket water heat exchangers prior to the period of extended operation
 - Modified Open Cycle Cooling Water AMP to include performance testing (heat transfer capability)
[Commitment 4]



EXAMPLES OF AUDIT AND REVIEW TEAM FINDINGS AND RESULTS

- Originally committed to inspect buried piping only during opportunistic inspections
 - Modified Buried Piping AMP to say [Commitment 13]
 - Opportunistic inspection may be used to satisfy inspection requirements, but in no case will frequency of inspection exceed 10 years
 - Inspection by qualified coating inspector
- Structures Monitoring Program originally not consistent with GALL
 - Modified AMP to [Commitment 16]
 - Include inspections of the submerged portions of the Service Water Intake Structure on a frequency not to exceed five years
 - Specify annual groundwater monitoring inspection frequency for concrete structures
 - Specify inspection frequency for the Service Water Intake Structure and Intake Canal to not exceed five years



Section 3.1, Reactor Vessel, Internals, and Reactor Coolant System

- Reactor Vessel and Internals
- Neutron Monitoring System
- Reactor Manual Control System
- CRD Hydraulic System
- Reactor Coolant Recirculation System



Reactor Vessel and Internals Structural Integrity Program (RV&ISIP)

- The RV&ISIP is a plant-specific aging management program
- The RV&ISIP inspections are based on the augmented inspections recommended in BWRVIP
- Commitment # 22 defines which BWRVIP reports are included in the scope of the RV&ISIP and additional specific augmented activities that will be taken by the applicant



Reactor Vessel Surveillance Program (RVSP)

- The RVSP monitors for the impact of neutron irradiation on the fracture toughness properties of RV materials
- The RVSP is based on the integrated surveillance program criteria in BWRVIP-78 and BWRVIP-86
- The RVSP will be enhanced to include conformance with the updated integrated surveillance program criteria in BWRVIP-116, once approved by the NRC (Commitment #10)



Section 3.2, Engineered Safety Features Systems

- 10 Plant-Specific Systems
- In response to RAI 3.2.4, the applicant is committed to manage the loss of material and cracking for small-bore Class 1 piping in treated water (include steam) (internal) environments, using the One Time Inspection program (commitment 11)



Section 3.3, Auxiliary Systems

- 34 plant-specific systems
- Applicant committed to add to Preventive Maintenance Program, routine sampling and analysis to address corrosion concerns related to potential water intrusion into lubricating oil in the Service Water Pump Motor Cooler Coils and the Emergency Diesel engines Lube Oil System (Commitment 24)
- Additionally, applicant committed to add to One Time Inspection Program at least one of the four Emergency Diesel Engine Sumps and at least one of the ten Service Water Pump Lubricating Oil Cooling coils for corrosion products and evidence of moisture (Commitment 11)



Section 3.4, Steam and Power Conversion Systems

- 13 Plant Specific Systems
- The applicant's AMR result for the titanium components in a raw water environment was an issue requiring additional information. The applicant clarified that the titanium in a raw water environment at a temperature less than 160 degree F does not exhibit aging effects. The titanium tubes in a raw water environment are at a temperature less than 160 degree F.



Section 3.5, Containments, Structures and Component Supports

- Containment
- Other Class 1 and In-Scope Structures (15)
- BSEP Credits ASME Section XI, Subsection IWE and 10 CFR Part 50, Appendix J for management of Drywell Liner
- Both IWE and Appendix J requires 100% inspection per period, there are 3 periods per interval, and each interval is ten years.



Aging Management of In-Scope Inaccessible Concrete

	Aggressive Limit	BSEP
pH	<5.5	6.4 – 7.5
Chlorides	>500 ppm	11 – 49 ppm
Sulfates	>1500 ppm	2 – 66 ppm

- Ground water phosphate level at 0.12 ppm
- Below grade environment is non-aggressive



Section 3.6, Electrical and I & C

- Component/Commodities subject to AMR
 - Non EQ Insulated Cables and Connections
 - Phase Bus
 - Non EQ Electrical/ I & C Penetration Assembly
 - High Voltage Insulators
 - Switchyard Bus
 - Transmission Conductors



Section 3.6, Electrical and I & C

- Applicant committed to add to Preventive Maintenance Program, periodic inspection of High-Voltage Insulators for Water Beading on Silicone Coating and for age related degradation (Commitment 24)
- Applicant committed to include in the Phase Bus Aging Management Program, inspecting the interior condition of the bus enclosure and perform thermography on a 10 year- frequency while bus is energized and loaded (Commitment 25)



Section 4: Time-Limited Aging Analyses (TLAAs)

- 4.1 Identification of TLAAs
- 4.2 Reactor Vessel Neutron Embrittlement
- 4.3 Metal Fatigue
- 4.4 Environmental Qualification of Electrical Equipment
- 4.5 Concrete Containment Tendon Prestress
- 4.6 Containment liner Plate and Penetration Fatigue Analysis
- 4.7 Other Plant Specific TLAAs



Section 4.2, Reactor Vessel Neutron Embrittlement

- Ten TLAAAs identified on neutron irradiation embrittlement
 - Neutron Fluence Calculations
 - Upper-Shelf Energy (USE)
 - Pressure-Temperature (P-T) Limits
 - Adjusted Reference Temperature
 - Circumferential Weld Calculations
 - Axial Weld Probability of Failure Analysis
 - Shroud Repair Hardware Analysis
 - Core Plate Plug Analysis
 - Core Shroud Thermal Shock Reflood Analysis
 - RV Thermal Shock Reflood Analysis (Added in response to RAI)



Reactor Vessel (RV) Upper Shelf Energy (USE) Equivalent Margins Analysis (EMA)

RV Material	TLAA (EMA) Basis	Acceptance Criterion	BSEP-1 Value	BSEP-2 Value
Limit. Plate	BWRVIP-74-A %Drop in USE	<23.5	21.0 (BSEP) 21.0 (Staff)	17.0 (BSEP) 17.1 (Staff)
Limit. Weld	BWRVIP-74-A %Drop in USE	<39.0	14.1 (BSEP) 14.1 (Staff)	13.3 (BSEP) 13.5 (Staff)
Nozzle Forging	Plant Specific - Fluence (n/sq cm)	<1.6E18	1.38E18 (Staff)	1.38E18 (Staff)
Nozzle Weld	BWRVIP-74-A %Drop in USE	<35.0	12.0 (Staff)	12.0 (Staff)

- TLAA for USE/EMA were in all cases determined to be acceptable under 10 CFR 54.21(c)(1)(i) or (ii)



RV Circumferential Weld/ RV Axial Weld Probability of Failure Analyses

RV Material	TLAA Basis	Acceptance Criterion ($^{\circ}$ F)	BSEP-1 Value ($^{\circ}$ F)	BSEP-2 Value ($^{\circ}$ F)
Limiting Circ. Weld	BWRVIP-05 Mean RT_{ndt} Value in $^{\circ}$ F	<70.6	6.6 (BSEP) 6.6 (Staff)	-34.1 (BSEP) -34.1 (Staff)
Limiting Axial Weld	BWRVIP-05 Mean RT_{ndt} Value in $^{\circ}$ F	<114.0	53.0 (BSEP) 52.8 (Staff)	53.0 (BSEP) 52.5 (Staff)

- TLAAAs for the Circ. Weld and Axial Weld Mean RT_{ndt} values were in all cases determined to be acceptable under 10 CFR 54.21(c)(1)(i) or (ii)



Section 4.3, Metal Fatigue

- Effect of Reactor Coolant Environment on Fatigue Life of Components and Piping (Generic Safety Issue 190)
 - Applicant performed refined fatigue analysis based on data collection from Cycle Evaluation Module (CEM) and finite element analysis from Fatigue Monitoring Program to show CUF will remain below the ASME Code limiting value
 - Staff found applicants assessment acceptable in accordance with 10 CFR 54.21(c)(1)(ii)



Section 4.4, Environmental Qualification (EQ) of Electrical Equipment

- Applicant's EQ Program consistent with GALL AMP, X.E1, "Environmental Qualification of Electrical Components"
- Operating Experience identified no age-related equipment failures that its program is intended to prevent



Section 4.6, Containment Liner Plate, Metal Containments and Penetration Fatigue Analysis

- Torus Downcomer/Vent Header Fatigue Analysis
- Torus – Attached and SRV Piping System Fatigue Analyses
- The staff accepted the evaluation in accordance with 10 CFR 54.21(c)(1)(ii)



Section 4.7, Other Plant Specific TLAA's

- Torus Component Corrosion Allowance
 - Component supports classified as ASME Section XI, In-service-Inspection (ISI) supports and non-ASME Section XI, ISI supports
 - Staff needed additional information on calculations for corrosion rates for ASME components and clarification on One Time Inspection program for non-ASME ISI supports
- In letter dated March 31, 2005 the applicant presented calculations for corrosion rates and descriptions on OTI program for non-ASME ISI supports
- The staff accepted the evaluation in accordance with 10 CFR 54.21(c)(1)(ii)



TLAA Summary

- TLAA
 - 10 CFR 54.3
 - TLAA list adequate, as amended
 - 10 CFR 54.21 (c) (1)
 - (i) - analysis remain valid for period of extended operation
 - (ii) - analysis have been projected to the end of the period of extended operation
 - (iii) - effects of aging on the intended function will be adequately managed for the period of extended operation.