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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

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POWER UPDATES SUBCOMMITTEE

+ + + + +

OPEN SESSION

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FRIDAY

FEBRUARY 24, 2012

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ROCKVILLE, MARYLAND

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

COMMITTEE MEMBERS PRESENT:

WILLIAM J. SHACK, Chairman

J. SAM ARMIJO, Member

SANJOY BANERJEE, Member

CHARLES H. BROWN, JR., Member

1 JOY REMPE, Member*
2 STEPHEN P. SCHULTZ, Member
3 JOHN D. SIEBER, Member
4 GORDON R. SKILLMAN, Member

5

6 ACRS CONSULTANT:

7 GRAHAM WALLIS

8

9 NRC STAFF PRESENT:

10 WEIDONG WANG, Designated Federal Official

11 PAUL CLIFFORD, NRR

12 ALLEN G. HOWE, NRR/DORL

13 JASON C. PAIGE, NRR/DORL

14 BENJAMIN PARKS, NRR

15 ANTHONY ULSES, NRR/DSS

16 SHIH-LIANG WU, NRR

17

18 ALSO PRESENT:

19 LIZ ABBOTT, FPL

20 MARK AVERETT, FPL

21 PAUL BANASZAK, FPL

22 CESARE FREPOLI, Westinghouse

23 RUDY GIL, FPL

24 PAUL KERSTING, Westinghouse

25 MIKE KILEY, FPL

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ED MONAHAN, Westinghouse

CARL O'FARRILL, FPL

TOM RODACK, Westinghouse

SAM SHAFER, FPL

PHILIP TIEMAHN, FPL

MIKE WATSON, Westinghouse

*Participating via telephone

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P R O C E E D I N G S

(8:30 a.m.)

CHAIR SHACK: The meeting will now come to order. This is a meeting of the Power Uprates Subcommittee, a standing subcommittee of the Advisory Committee on Reactor Safeguards.

I'm Bill Shack, Chairman of the Subcommittee. ACRS members in attendance are Jack Sieber, Sanjoy Banerjee, Steve Schultz, Dick Skillman, Sam Armijo, Charles Brown, and our consultant, Graham Wallis.

Also joining us on the phone is Member Joy Rempe, who will be, as soon as she beeps on the phone, will be connected to us. Weidong Wang of the ACRS staff is the Designated Federal Official for this meeting.

In this meeting, the Subcommittee will review Turkey Point Power Units 3 and 4 License Request for Extended Power Uprate. We will hear presentations from the NRC staff and the representatives from the Applicant, Florida Power and Light Company.

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

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1 agenda items on thermal conductivity degradation and
2 fuel system design, the presentations will be closed
3 in order to discuss information that is proprietary to
4 the Applicants and its contractors pursuant to 5 USC
5 52(b)(c)(4).

6 Okay, so this portion of the meeting
7 dealing with such information will be limited to the
8 NRC staff and its consultants, Florida Power and Light
9 Company, and those individuals and organizations who
10 have entered into an appropriate confidentiality
11 agreement with them. Consequently, we will need to
12 confirm that we have only eligible observers and
13 participants in the room for the closed portion.

14 The Subcommittee will gather information,
15 analyze relevant issues and facts, and formulate
16 proposed positions and actions as appropriate for
17 deliberation by the full Committee. The rules for
18 participation in today's meeting have been announced
19 as part of the notice of this meeting previously
20 published in the Federal Register.

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

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

4 We will now proceed with the meeting, and
5 I assume, Mr. Howe, you will start us off.

6 MR. HOWE: Yes. Thank you. Good morning.
7 I'm Allen Howe, the Deputy Division Director in the
8 Division of Operating Reactor Licensing in the Office
9 of Nuclear Reactor Regulation. We appreciate the
10 opportunity to brief the ACRS Power Upgrades
11 Subcommittee this morning on the Turkey Point extended
12 power upgrade application.

13 Last December, on the 14th and followed up
14 with a meeting on the 19th, we briefed the
15 Subcommittee and then the full Committee on this
16 topic. As a result of several remaining open items at
17 the conclusion of the full Committee meeting in
18 January, specifically the thermal conductivity
19 degradation issue, the ACRS members requested that the
20 staff rebrief the Subcommittee.

21 In preparation for today's meeting, the
22 staff worked diligently, and we resolved the open
23 items. Jason Page will walk us through an overview of
24 the open items during his presentation in a few
25 moments.

1 Also today the licensee will address the
2 open items and questions from the application, and the
3 NRC as part of their staff presentation will focus our
4 discussions on the thermal conductivity degradation,
5 the fuel system design, and grid crush issues. The
6 staff will also be available today to answer any
7 questions that you might have.

8 Staff's review has been very thorough.
9 I'm very pleased with it. During the course of the
10 review, including the recent events to address the
11 thermal conductivity degradation and other emerging
12 issues, the staff had frequent communications with the
13 licensee, including conference calls, letters,
14 requests for information and audits, as well as public
15 meetings. We believe this dialogue has contributed
16 positively to our overall review.

17 Just one other note I want to make to the
18 Committee before I turn it over to Jason is just more
19 broadly on the thermal conductivity degradation issue.
20 We issued requests for additional information pursuant
21 to 10 CFR 50.54(f) to 11 nuclear power units that use
22 the Westinghouse-furnished realistic emergency core
23 cooling system evaluation models. We did that on the
24 16th of February.

25 These 11 units currently have reported

1 peak cladding temperatures above 2,000 degrees
2 Fahrenheit. The letters requested the licensees
3 provide an estimate of the effect of thermal
4 conductivity degradation error on the peak cladding
5 temperatures and also the methodology and the
6 assumptions used to determine the estimates.

7 The licensees have until March 19 to
8 provide their response to this request, and the reason
9 we did that, again, was to gather additional
10 information to understand where they were relative to
11 the regulatory limit of 2,200 degrees, factoring in
12 the thermal conductivity error.

13 At this point, I'll turn over the meeting
14 to our project manager on the Turkey Point extended
15 power uprate, Jason Paige.

16 MEMBER SIEBER: Could I ask a question?
17 Is the thermal conductivity problem unique to the
18 ASTRUM code?

19 MR. HOWE: I'll give you a short answer.
20 I think we have folks here from Reactor Systems. It
21 is applicable to ASTRUM, but it's also applicable to
22 other methodologies that Westinghouse has used, so
23 some of the 11 I believe are units that do not use
24 ASTRUM.

25 MEMBER SIEBER: That's correct.

1 MR. HOWE: They use a different
2 methodology.

3 MEMBER SIEBER: And this has existed since
4 when, time immemorial?

5 MR. HOWE: We identified the issue and put
6 out an Information Notice in 2009 when we first
7 identified the issue, and then it took a period of
8 time and additional analysis to get a more refined
9 picture of it. We issued another Information Notice
10 last December.

11 MEMBER SIEBER: So one could say that this
12 is defect in analytical methods that's existed for
13 many years?

14 MR. HOWE: I'm going to have to turn to
15 one of the folks who is a little bit closer to it.
16 Tony, can you talk about that?

17 MR. ULSES: Yes, I'm Tony Ulses. I'm the
18 Branch Chief of Reactor Systems. Actually, I
19 apologize. Could you repeat your question? I'm
20 sorry. I don't remember exactly.

21 MEMBER SIEBER: The question is even
22 though this is recently identified, 2009, I presume
23 that since ASTRUM was built on previous codes that the
24 issue of bad estimates or incorrect estimates of
25 thermal conductivity at relatively high burnups has

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1 existed for long periods of time, years?

2 MR. ULSES: The short answer is yes. This
3 is not a new phenomenon. What is new is an
4 understanding of the impact of actually addressing it
5 as you work it through the entire evaluation model.
6 That's information that we did not have until December
7 of last year.

8 MEMBER SIEBER: Okay, and are you going to
9 cover this in more detail today?

10 MR. ULSES: We have a discussion on this
11 when we get into the proprietary session, yes sir.

12 MEMBER SIEBER: Okay.

13 CHAIR SHACK: Just a quick question. I
14 mean, I assume you picked best estimate codes because
15 they have less inherent conservatism, so they might be
16 more effective. How about other people's best
17 estimate codes? Are none of them above 2,000?

18 MR. ULSES: Well, we've looked at the
19 other vendors, and the other vendors have taken action
20 to address this in their own unique ways.

21 MEMBER ARMIJO: So, in the BWRs, you know,
22 they don't get to such high peak temperatures, but do
23 the same effect exist in the other vendors' codes?

24 MR. ULSES: Well, the short answer, again,
25 the vendor -- the other vendors have taken action to

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1 address this in their codes and to speak specifically
2 about BWRs. There are no best estimate methods being
3 used currently by the BWR fleet.

4 MEMBER ARMIJO: Okay.

5 MR. ULSES: So what we were talking about
6 earlier about the Appendix K type of approach really
7 applies to that discussion.

8 MEMBER ARMIJO: Okay. Thank you.

9 MEMBER SIEBER: I presume, too, that BWRs,
10 to my knowledge, operate at lower peak temperatures
11 than PWRs. It's more margin building.

12 MEMBER BANERJEE: Is this problem sort of
13 highlighted because of high burnups? It's sort of
14 like, what five to seven percent degradation for every
15 ten megawatt days per ton or something -- or
16 gigawatts, yes.

17 MR. ULSES: Well, I can't quote the actual
18 magnitude off the top of my head, Dr. Banerjee, but
19 essentially the issue is unique to high burnup fuel
20 phenomenon and how the cores are operated now relative
21 to, say, how they were operated 15, 20 years ago.

22 MEMBER SIEBER: So 30 years ago a
23 discharge burnup, average for a discharge burnup was
24 about 33,000 --

25 MR. ULSES: It was much lower, yes.

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1 MEMBER SIEBER: -- megawatt-days per ton.
2 I've seen numbers in the 58,000 now for some
3 assemblies which does make an impact.

4 MR. ULSES: That's true.

5 MEMBER BANERJEE: So you're going to speak
6 in some detail about the phenomenon at some point?
7 All right.

8 MR. ULSES: I'm not sure exactly what we
9 have in our proprietary session. It was early. We
10 can look at the slides. We have discussion about it.
11 We can answer questions when we get there.

12 CHAIR SHACK: We need to be in the
13 proprietary session before I think we ask too many
14 questions.

15 MEMBER BANERJEE: Yes, so let's --

16 CHAIR SHACK: Let's move on.

17 DR. WALLIS: Can I ask a question, since
18 we talked about history and said this was recently
19 discovered? We were supplied with a letter from Sam
20 Collins in 2002, which said that use of PAD 4.0 TCD
21 was a licensing condition for this plant, so it looks
22 as if TCD was an issue in 2002.

23 MR. HOWE: Okay, I'm not familiar with
24 that letter, so it's --

25 MEMBER BANERJEE: Yes, it's in the

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1 material we got.

2 DR. WALLIS: It puzzled me when I heard
3 that. If it's an issue ten years old, you'd think it
4 would have been resolved long ago.

5 MEMBER BANERJEE: It was identified in
6 1996 in the paper that we got from Halden.

7 MEMBER SIEBER: Right. That's where the
8 new insights came from.

9 CHAIR SHACK: Yes, I mean, there is an
10 Information Notice, but it's December where they sort
11 of really flagged it as sort of having the estimate of
12 the magnitude of the impact, I guess, that it had.

13 DR. WALLIS: But it puzzled me why this
14 was a licensing condition ten years ago. There seemed
15 to be all these RAIs, which start off with use of the
16 old version of PAD 4.0 without TCD. This has just
17 puzzled me. I don't know if you have an answer to it.

18 MR. HOWE: At this moment, no.

19 DR. WALLIS: Okay.

20 MR. ULSES: Yes, I'm not directly familiar
21 with the letter that you're referring to, Dr. Wallis.
22 It's something that we can look into it. You know, as
23 I said earlier, though, the issue really manifested
24 itself when we saw the impact as it was washed
25 effectively through the entire evaluation model from

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1 looking at the actual field performance code and then
2 looking at the actual figure of merit, which in this
3 case is PCT. We've never seen that entire analytical
4 stream work through with the correction for the error
5 until last year, December.

6 MR. PAIGE: Good morning. My name is
7 Jason page. I'm the project manager in the Office of
8 NRR assigned to Turkey Point. First, I'd like to take
9 this opportunity to thank the ACRS members for your
10 effort in reviewing the proposed EPU application and
11 revised safety evaluation with such a short
12 turnaround.

13 I also want to express my thanks to the
14 NRC staff for conducting a thorough review of a very
15 complex application and also for providing support to
16 these meetings. During today's Subcommittee meeting
17 you will hear from both the licensee and the NRC staff
18 in providing you with the details of the EPU
19 application.

20 The objective is to provide additional
21 follow-up information relating to the details of the
22 Turkey Point EPU application and provide the staff's
23 actions to resolve the open items generated during and
24 after the ACRS Subcommittee meeting on December 14,
25 2011.

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1 Before I cover the resolved open items and
2 agenda for today's meeting, I would like to provide
3 some background information related to the proposed
4 EPU. On October 21, 2010, the licensee submitted its
5 license amendment request for Turkey Point Units 3 and
6 4 EPU.

7 The proposed amendment will increase each
8 unit's license core power level from 2,300 megawatt
9 thermal to 2,644 megawatt thermal. This represents a
10 net increase in license core thermal power of 15
11 percent, including a 13 percent power uprate and a 1.7
12 percent measurement uncertainty recapture. This is a
13 20 percent increase from the original license thermal
14 power.

15 The staff's method of review was based on
16 RS-001, which is NRC's review plan for EPU's. As you
17 know, it provides a safety evaluation template, as
18 well as matrices that cover the multiple technical
19 areas that the staff is to review.

20 There are no associated linked or -- there
21 are no associated or linked licensing actions
22 associated with the EPU application. FPL previously
23 submitted two license amendments for Turkey Point, the
24 AST amendment in 2009 and the spent fuel criticality
25 analysis amendment in 2010. The NRC staff approved

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1 the AST and spent fuel pool criticality analysis
2 amendments in June 23 -- on June 23 and October 31,
3 2011, respectively.

4 Finally, there were numerous supplements
5 to the application responding to multiple staff REIs.
6 Overall, there were approximately 50 supplemental
7 responses which supported our draft safety evaluation.
8 Also, the staff completed several audits to complete
9 its review and resolve open items.

10 As Allen mentioned, on December 14, 2011,
11 and January 19, 2012, we briefed the ACRS Power Uprate
12 Subcommittee and full Committee on this topic, but as
13 a result of several items remaining open at the
14 conclusion of the January 19, 2012 full Committee
15 meeting, specifically the thermal connectivity
16 degradation issue, the ACRS members requested that the
17 staff rebrief the Subcommittee.

18 This slide shows all of the items that
19 remained open after the conclusion of the January 19
20 full Committee meeting. All open items have been
21 resolved by the staff, and, as requested, the staff
22 provided all licensee supplements to address the open
23 items to the ACRS staff. Also, the staff provided a
24 revised safety evaluation to the ACRS staff on
25 Tuesday, February 21, 2012, with a list of sections

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1 that were revised to close out the open items.

2 This slide is the topics for today's
3 discussion. The topics were determined from the
4 action items or issues that remain open after the
5 conclusion of the full Committee meeting.

6 First, the licensee will provide an
7 introduction, which will include an overview of the
8 proposed EPU and status of the review, and FPL will
9 provide additional details and clarifying information
10 on discussion topics from the ACRS full Committee
11 meeting on January 19. The NRC staff will then
12 present on the thermal connectivity degradation and
13 fuel system design grid crush issues.

14 The staff is only presenting on these
15 items, because these were the only open items that
16 changed the technical evaluation of the SE or not
17 considered as open items that only validated
18 information in the safety evaluation provided to you
19 last year in preparation of the ACRS Subcommittee on
20 December 14, 2011.

21 Even though the other technical review
22 areas are not being presented today, the staff is
23 available to address any questions you might have.
24 Lastly, the staff's thermal connectivity degradation
25 presentation will be a closed session due to the --

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1 due to there being proprietary information in the
2 slides.

3 Unless there are any other questions, I'll
4 turn it over to FPL, Mr. Mike Kiley. Mike is the Site
5 Vice President for Turkey Point Units 3 and 4.

6 MR. KILEY: All right. Good morning. My
7 name is Mike Kiley. As Jason said, I'm the Site Vice
8 President at Turkey Point.

9 With me today to my immediate left is
10 Mark, Mark Averett. He has not presented here
11 previously at either the Subcommittee meeting or the
12 full Committee meeting. He is the Manager of PRA for
13 the fleet, and he'll be here to address any PSA
14 questions that do come up, and he does have a section
15 of the presentation.

16 To his left, Steve Hale, who you have seen
17 before. Steve is the Director of EP Licensing, and to
18 the far left, although he does not have a speaking
19 role today, Sam Shafer, one of the Assistant
20 Operations Managers and over 20 years of experience
21 and a licensed SRO at the station.

22 First of all, I'd like to thank the ACRS
23 Subcommittee for the opportunity to present the EPU
24 license amendment request for Turkey Point here today.
25 Since the ACRS Subcommittee meeting and the full

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1 Committee meetings, we have worked very closely with
2 the NRC staff to close the remaining open action
3 items.

4 We recognize and appreciate the importance
5 of the staff's questions, particularly those
6 surrounding thermal connectivity degradation. The
7 staff performed a detailed review of FPL's analysis,
8 including a multi-day audit in which we presented our
9 analysis to the staff.

10 This audit and other audits performed by
11 the NRC resulted in a thorough and comprehensive
12 review of the proposed EPU, so at this point I'd like
13 to turn it over to Steve Hale, and we are open to any
14 questions.

15 MR. HALE: Thanks, Mike. Next slide.
16 First, as Jason mentioned, after the ACRS --

17 CHAIR SHACK: Just a second, Mr. Hale.
18 Joy, can you hear us now? Maybe she's on mute. Okay.
19 Her email says she can hear us, so move ahead.

20 MR. HALE: All right. Okay, as Jason
21 mentioned, after the full Committee meeting we had
22 four open items remaining, the new fuel storage area
23 tech spec PCD, as we've already discussed, fuel
24 seismic/LOCA loading, and we also had two I&C RAIs.

25 We have provided all of our responses to

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1 the staff, and, as Jason mentioned, some open items
2 have been closed in the SE, and the NRC staff did
3 issue the revised SE this week.

4 CHAIR SHACK: Just a minute again. Joy,
5 can you hear us now?

6 MEMBER REMPE: I can. Can you hear me?

7 CHAIR SHACK: Yes, I think you've got to
8 back off from the phone a little bit.

9 MEMBER REMPE: Okay. I will turn the
10 volume down. Is that better?

11 CHAIR SHACK: I think a little more.

12 MEMBER REMPE: I can put it on mute, too.

13 CHAIR SHACK: Speak very softly. Now
14 you've gone.

15 MEMBER BROWN: She's on mute.

16 CHAIR SHACK: She's on mute. Okay.

17 MR. HALE: Why don't you back it up there,
18 Sam? What we thought, at the full Committee meeting
19 there were a number of questions related to loss of
20 offsite power, ERA, so what we thought, the staff will
21 be covering the open items, but we thought it would be
22 worthwhile to brief the Subcommittee on some of those
23 so that it's clear in everyone's mind, you know, what
24 are the impacts of the EPU for these two events.

25 The first action, Dr. Skillman, right, you

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1 had a question regarding --

2 MEMBER SKILLMAN: Mr. Skillman, yes, sir.

3 MR. HALE: Mister. I'm sorry.

4 MEMBER SKILLMAN: Steve, thank you.

5 MR. HALE: You had a question regarding
6 the applying an uncertainty on pressure. We went with
7 a lower pressure versus a higher pressure uncertainty,
8 and intuitively you would think if you went with a
9 higher pressure that you would get a worse result. I
10 believe that was the genesis of the question.

11 MEMBER SKILLMAN: That is accurate, yes,
12 sir.

13 MR. HALE: What we did is we went back and
14 ran the case as you had requested, and, as expected,
15 the reason the higher pressure case is more
16 conservative -- is less conservative is you get a
17 earlier reactor trip.

18 MEMBER SKILLMAN: Yes, sir.

19 MR. HALE: So that is the reason we go
20 with the lower pressure, because it maximizes the
21 pressure of the event.

22 MEMBER SKILLMAN: I understand your answer
23 and accept it, and I thank you for doing that work.

24 MR. HALE: Okay.

25 MEMBER SKILLMAN: Thank you.

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1 MR. HALE: Very good.

2 CHAIR SHACK: Just out of curiosity, I
3 notice your current analysis has a margin of .1 psi.
4 Now, that's really slicing it pretty thin.

5 MR. HALE: Yes.

6 CHAIR SHACK: What did you change in the
7 input analysis to get the whopping 1.9 psi that you
8 have now?

9 MR. HALE: Ed, do you want to speak to
10 that? We have --

11 MR. MONAHAN: This is Ed Monahan from
12 Westinghouse. What we did was we changed the
13 pressurizer safety valve set pressures, the pressure
14 at which they open. They had to reduce those in order
15 to support the EPU.

16 MR. HALE: Okay. Moving on, we had quite
17 a bit of discussion at the full Committee meeting on
18 loss of offsite power. What we did as a result of
19 that discussion is go back and look at the historical
20 performance of the grid associated with Turkey Point.

21 We've actually only had one dual-unit
22 LOOP, and that was as a result of Hurricane Andrew in
23 August of 1992, but, of course, both units have been
24 placed in a safe condition in anticipation of the
25 onset of hurricane force winds. There have been

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1 several single-unit LOOPS that were not grid-related
2 but were generated, you know, either onsite or in the
3 switch yard.

4 One event that is not listed here that I
5 would mention, there was a grid disturbance in
6 February of 2008, which resulted in a partial blackout
7 in Florida. However, although both units tripped, the
8 units did not lose offsite power during that event.
9 We were actually fast-bus transferred to offsite
10 power.

11 In looking at it from a PRA standpoint,
12 the dual-unit LOOP frequency is a .02 per year, but
13 when you look at it from a core damage frequency for
14 a dual-unit LOOP it's in the order of 8×10^{-8} per
15 year.

16 When we looked at the transient results,
17 the criteria that we need to meet for a Cat 2 event is
18 that we don't fill the pressurizer. In other words,
19 you don't go water solid in a pressurizer event, and
20 the results, because it's a fairly quick transient,
21 are very comparable to our current licensing cases.

22 One point that we wanted to make very
23 clear, because I think there was some confusion
24 associated, we have not added any new operator actions
25 as a result of the EPU in response to a LOOP. Any

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1 other questions on that?

2 Okay, the next topic I thought would be
3 worthwhile to just touch on a little bit, Turkey Point
4 is somewhat unique. We do have some shared systems at
5 the site, and, as Mark will get into, these shared
6 systems really contribute to a relatively low core
7 damage frequency. In other words, there are some
8 benefits from a PRA standpoint.

9 As we discussed at the last meeting, for
10 the emergency core cooling systems we do have four
11 pumps for both units. These units start on an SI
12 signal from either unit.

13 So, in other words, all four pumps start,
14 but you have an SI at Unit 3 or Unit 4. Two are
15 required for LOCA, and only one is required for other
16 events, and each pump is aligned to an individual
17 diesel generator, so it's four diesel generators, and
18 the pumps are aligned to each individual EDG.

19 With regard to the auxiliary feedwater
20 system, it is somewhat unique for Turkey Point, as
21 well. We have three turbine-driven pumps for both
22 units. One pump can satisfy the requirements of both
23 units. So, in other words, we have the AFW function
24 without any AC power available.

25 MEMBER BROWN: Is that simultaneously?

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1 MR. HALE: Hmm?

2 MEMBER BROWN: Simultaneously?

3 MR. HALE: Yes.

4 MEMBER BROWN: Okay. I just want to make
5 sure I understand.

6 MR. HALE: In addition to that, we also
7 have a full capacity diesel-driven standby feedwater
8 pump, although it's not, you know, not an aux
9 feedwater pump. It is available for use. It has its
10 own standby diesel, so the combination of that
11 provides us --

12 DR. WALLIS: What's the capacity of this
13 diesel pump?

14 MR. HALE: It's much greater than the AFW
15 pump. It's used for a number of other functions, as
16 well, but as you might imagine, that provides some
17 fairly significant benefits from a PRA standpoint.
18 Also, the EDGs, we've got two for each unit, and they
19 all start with an SI signal from either unit.

20 Also, the EDGs can be cross-tied from the
21 control room. This was a feature we installed in the
22 late eighties which allows an -- under a station
23 blackout scenario, you could actually power both units
24 from a single diesel and maintain safe conditions.

25 MEMBER SKILLMAN: Steve, back to your

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1 comment regarding can perform function without AC
2 power, turbine-driven aux feedwater pumps are magic
3 machines. They both consume heat and deliver coolant,
4 but they do have a control system.

5 MR. HALE: Right.

6 MEMBER SKILLMAN: Is this a DC?

7 MR. HALE: Yes. Yes.

8 MEMBER SKILLMAN: NI 1, Class 1 type of
9 system?

10 MR. HALE: Yes. Yes.

11 MEMBER SKILLMAN: Thank you.

12 CHAIR SHACK: I was curious, your reported
13 PRA numbers are like a factor of 40 almost lower than
14 they were when you had your license renewal SAMA
15 stuff. Was all this equipment in place then, or is
16 some of it newer? Is all that change due to
17 essentially an analysis change?

18 MR. HALE: It's essentially an analysis
19 change. This equipment has been in place for some
20 time, and Mark will get into some details on the PRA
21 and one of the reasons why, you know, Turkey Point's
22 PRA is somewhat lower than the baseline.

23 DR. WALLIS: Somewhat lower.

24

25 MR. HALE: Yes.

1 MEMBER SCHULTZ: Steve, with respect to
2 the DC power supply, what is the anticipated time of
3 operation available for the DC power?

4 MR. SHAFER: This is Sam Shafer, Florida
5 Power & Light. Right now, about 80 percent battery
6 life will look good two hours. We do have bus load
7 stripping to get down to the minimum essential
8 equipment, which will give us a criteria for 80
9 percent capacity for a two-hour run.

10 MR. HALE: Okay, if there are no more
11 questions with that, I'll turn it over to Mark, and
12 he'll run through and provide some details on the
13 Turkey Point probabilistic safety assessment.

14 MEMBER SKILLMAN: Steve, before you do
15 that, let me ask a question. Forgive me for being new
16 on the Committee, but since the last meeting or two
17 I've been involved with this a question has arisen in
18 my mind, and it might be one that's easily answered.

19 For this uprate, did you go back and
20 recreate your utilization factor for cycles so that as
21 you add the uprated power, as you look at all the
22 conditions that are going to be introduced to this
23 rather aged unit that you know your ASME Section III
24 Class 1 analyses are accurate in terms of U, or
25 utilization, thermal cycles?

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1 MR. HALE: Yes. Yes.

2 MEMBER SKILLMAN: If I could ask, how did
3 you do that, please?

4 MR. HALE: Well, you basically look at
5 temperatures. At Turkey Point, our fatigue analysis
6 is specifically related to Class 1 components, you
7 know, steam generators.

8 We did an extensive view of fatigue and
9 utilization factors for license renewal. We got into
10 and we did a detailed review of TUFs. We also looked
11 at our historical performance on transients and looked
12 at a projection of our transients for 60 years.

13 Now, when you look at an EPU, you've got
14 to look at the temperatures, and what you see is
15 there's relatively minor changes in overall transient
16 temperatures with regard to Class 1 components and
17 fatigue, but we did address that, and, fortunately, as
18 a result of license renewal we had updated all those
19 analyses, so it was a fairly simple exercise to go
20 back and look at the impact of the changes in
21 temperature regarding EPU relative to that fatigue
22 analysis.

23 MEMBER SKILLMAN: Thank you, Steve.

24 MR. HALE: Yes.

25 MEMBER SKILLMAN: Thank you.

1 MR. HALE: Go ahead, Mark.

2 MR. AVERETT: My name is Mark Averett.

3 I'm a Lead PR Analyst for Turkey Point. You want to
4 change the slide? Thank you.

5 Even though EPU is not formally a risk-
6 conformed submittal, we risk-conformed it, anyway.
7 The risk of the EPU was calculated using the Turkey
8 Point dual unit internal events PRA model, and that
9 was last updated in March 2010. The data is current
10 through the end of 2006, and we quantified core damage
11 frequency and large early release frequency.

12 What we used for internal flooding was the
13 IPE screening analysis, because at the time that's the
14 best we had. Next slide.

15 For external events analysis, we used the
16 IPEEE for seismic; we were in a low-seismicity area.
17 We were -- all we had was -- I wouldn't say all we
18 had. IPEEE walkdowns were considered sufficient to
19 address it, and that's what we used.

20 Internal fire events, we used the IPEEE
21 screening analysis, which did contain component-
22 capable mapping to fire zones, and we actually
23 quantified core damage frequency for those with a 10^{-6}
24 screening cutoff.

25 High winds, external floods,

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1 transportation events also from the IPEEE. Those were
2 pretty much looking at the initiating event
3 frequencies and looking at -- doing a qualitative
4 assessment looking at the design features in place to
5 withstand the event.

6 For shut-down risk, we don't have a shut-
7 down PRA like a lot of utilities. We address shut-
8 down risk with a defense-inducted procedure based on
9 NUMARC-9106 and implemented at the site.

10 Okay. For the actual internal events
11 analysis, we did four things to modify the internal
12 events PRA. We actually changed the logic models to
13 reflect the physical changes that were being made for
14 the EPU.

15 We did a human liability analysis update
16 to reflect the EPU-related timing changes, which
17 pretty much reduced some of the available times to the
18 operator to recover or to perform actions that were
19 modeled in the PRA.

20 There were some minor success criteria
21 changes for the LOCAs, and offsite power recovery
22 credit was revised to reflect EPU. Again, this
23 related to the timing issues available to recover
24 offsite power before, basically, it was too late.

25 CHAIR SHACK: Those LOCA success criteria,

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1 you've got four categories of LOCA.

2 MR. AVERETT: Right.

3 CHAIR SHACK: You didn't change the
4 criteria for the small-small. You changed it for the
5 small, medium, and large. Then I looked, and as I
6 expected, the frequencies for the medium and large
7 went up.

8 MR. AVERETT: The core damage frequency?

9 CHAIR SHACK: The core damage frequency,
10 and it went down for the small and the small-small.
11 Now, I would have thought it would have -- because I
12 have more restrictive success criteria, I expected to
13 see them go up or be unchanged. I was puzzled why the
14 small went down.

15 MR. AVERETT: The small LOCA went down?

16 CHAIR SHACK: The small LOCA went down,
17 yes.

18 MR. AVERETT: I thought the success
19 criteria changes were pretty much just limited to
20 medium and large LOCA.

21 CHAIR SHACK: Well, it's --

22 MR. AVERETT: I thought they were --

23 CHAIR SHACK: It said that there was a
24 minor -- you know, it's where you inject. It was
25 coldleg injection --

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1 MR. AVERETT: Right.

2 CHAIR SHACK: -- was what you had in
3 previous, and you had to change that for the --

4 MR. AVERETT: I thought it was just for
5 the medium and large break LOCAs, and it had to do
6 with the number of lines you required, or it may have
7 actually been for the high-head safety injection and
8 recirculation, the number of pumps you needed.

9 CHAIR SHACK: Yes, it was high-end safety
10 injection.

11 MR. AVERETT: I'm sorry, I don't remember
12 these in excruciating detail, but --

13 CHAIR SHACK: Let's see.

14 MR. AVERETT: But you're right. I
15 wouldn't have expected small LOCA to go down.

16 CHAIR SHACK: Down, yes, and it did, and
17 I was just curious as to why that happened. Now, of
18 course, I can't find that number. Oh, there it is.

19 MR. AVERETT: We actually reported the
20 individual recording frequencies by initiating event.

21 CHAIR SHACK: By initiating event.

22 MR. AVERETT: We did, and the CDFs went
23 down for small.

24 CHAIR SHACK: Yes, went from 8.7×10^8 to
25 7.1×10^{-8} , which just --

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1 MR. AVERETT: Oh, you know what might have
2 done that? If you go forward to Slide 19 -- sorry,
3 maybe it's been -- go back one. Oh, see this changes
4 to minimize risk increase? We changed the -- the
5 first one wouldn't have had any effect. That's feed-
6 and-bleed cooling. The second one might have had an
7 effect --

8 CHAIR SHACK: The second one might have
9 had an effect.

10 MR. AVERETT: -- because when you have an
11 SI signal, and I don't know if you're familiar with
12 this one, all the pumps come on. You have a small
13 LOCA. The RHR pumps come on. The high-head safety
14 injection pumps come on.

15 Well, the RHR pumps are just basically on
16 recirc, and we need to shut those down within a
17 certain amount of time. Otherwise, the water and the
18 recirc lines get too hot, and we assume that they
19 failed.

20 So, we moved the procedure step up to
21 afford the operator more time to do that. Therefore,
22 the probability of the operator failing to do that
23 would go down, and so that could possibly explain the
24 small break LOCA effect, and it was pretty minimal, I
25 think.

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1 CHAIR SHACK: Yes, it's small. It's just
2 counterintuitive.

3 MR. AVERETT: Yes. Okay, where are we?

4 MEMBER SCHULTZ: Mark, I've got a
5 question. You say the external events were assessed
6 qualitatively, and Steve mentioned earlier that the
7 dual-unit loss of offsite power frequency is .02 per
8 year. Is that something that you've looked at
9 recently? When was the last time you evaluated that
10 dual-unit loss of offsite power?

11 MR. AVERETT: You mean evaluate or came up
12 with the frequency?

13 MEMBER SCHULTZ: Came up with the
14 frequency.

15 MR. AVERETT: That would be, I believe, on
16 the previous slide. We had a data update that went
17 through 2006, so the data update probably was done in
18 late 2007, but so the offsite power date would be
19 through 2006.

20 MEMBER SCHULTZ: And is that done looking
21 at both the events that have occurred, dual-unit,
22 single-unit, and also the types of external events
23 that might cause dual-unit loss of offsite power?

24 MR. AVERETT: Well, the entire -- if you
25 look at the industry data, as well as our data, and do

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1 a Bayesian update of that data, for external events --
2 for external events, like are we talking about fire
3 and high winds?

4 MEMBER SCHULTZ: High winds, yes,
5 particularly.

6 MR. AVERETT: Yes, I guess the high winds
7 would be -- yes, offsite power is kind of like an
8 internal and an external event, so we do look at the
9 -- from an internal event perspective, we include
10 those losses of offsite power that are due to external
11 events, as well. Is that what you're asking?

12 MEMBER SCHULTZ: Yes, because you just
13 mentioned that it's assessed qualitatively for the
14 external events, I wanted to understand the
15 comprehensiveness of the evaluation of the dual-unit
16 loss of offsite power.

17 MR. AVERETT: Well, external events such
18 like the high winds and external floods, I guess you
19 would look at --

20 MEMBER SCHULTZ: Sorry?

21 MR. AVERETT: I think those are more --
22 it's a fairly high-level look at it, looking at the
23 initiating. For example, for external floods, of
24 course, you're looking at what can breach the grade of
25 the plant, and the conditional core damage probability

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1 is pretty much assumed to be one once you do that, so
2 really loss of offsite power doesn't play a role in
3 external flooding.

4 So, for fire I think we assume a loss of
5 offsite power, given a fire. For high winds, it's the
6 same thing as external flooding, looking at the
7 probability to get high winds to an extent that you
8 start compromising the diesel generators, and we
9 assume an offsite power, a loss of offsite power for
10 that.

11 MEMBER SCHULTZ: Okay, Mark. Thank you.

12 MR. AVERETT: Okay. I think I've already
13 -- we talked about external events, and IPEEE results
14 were reviewed for EPU impact, and the impact was
15 minimal. Shut-down risk, again, we addressed that
16 through defense in depth approach. We don't have a
17 shutdown PRA.

18 So I know that we have an administrative
19 procedure called Admin-51, which implements this
20 NUMARC-9106 guidelines in defense in depth, and those
21 -- we are going to be looking at that and modifying it
22 for APU impacts on color assignments, whether it's
23 green, yellow, orange, or red.

24 DR. WALLIS: All these things are assessed
25 qualitatively. How do you come up with a number?

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1 MR. AVERETT: We don't.

2 DR. WALLIS: You don't?

3 MR. AVERETT: Defense in depth is the
4 numbers associated with how many trains we --

5 DR. WALLIS: So how do you conclude
6 anything?

7 MR. AVERETT: From qualitative assessment,
8 the way you concluded stuff before PRA. You look at
9 it and give your best engineering judgment you can.

10 DR. WALLIS: The effect is small,
11 something like that?

12 MR. AVERETT: Yes.

13 DR. WALLIS: But you've got very small
14 numbers, anyway, here.

15 MR. AVERETT: Well, yes. Some things we
16 don't have a PRA for, though. Okay. Steve already
17 covered a lot of this, but it does have a substantial
18 effect on the PRA, and Mr. Shack, I believe you said
19 that you noted the CDF is quite low, and I've had to
20 defend that many times.

21 CHAIR SHACK: Yes, I was going to say it
22 looks like an AP1000.

23 MR. AVERETT: But it is kind of a unique
24 design. The first one I'd like to talk about is the
25 offsite unit RWST injection capability. Steve talked

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1 about the fact that you have -- say there are two
2 units, Unit 3 and Unit 4. If you had a small LOCA on
3 Unit 3, all four high-head safety injection pumps come
4 on and discharge into a common header, okay, so we
5 have two-unit, three pumps, two-unit, four pumps.

6 Unit 3 pumps take suction from the Unit 3
7 refueling water storage tank. Unit 4 pumps take
8 suction from the Unit 4 refueling water storage tank.
9 Once it's noted that the Unit 3 pumps are running
10 quite well, the Unit 4 pumps are shut down, okay.

11 Now, in the course of the event, if you
12 start having problems with the high-head safety
13 injection or later on through recirculation problems,
14 all the operator has to do, and he's procedurally
15 directed to do this, is basically turn on the Unit 4
16 pumps, and he has another factor of two redundancy
17 with a brand new, nice and full refueling water
18 storage tank. I don't know of any other plant in the
19 United States that has that.

20 Station blackout cross-ties, Steve told
21 you about the fact that we have four high-capacity
22 diesels, only one of which is actually necessary.
23 We'd like to have more than one, but if you only have
24 one, you could do a safe shutdown with one bus on each
25 of the two units.

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1 Also a nice feature -- oh, diesel. I'm
2 sorry. I'm jumping to the alternate cooling. The
3 diesel-driven standby steamer and feedwater pump, it's
4 a separate diesel-driven standby steamer and feedwater
5 pump. It takes suction from the mineralized water
6 storage tank. It's an extra 500,000 gallons you have
7 right there, and, lastly, we have alternate --

8 CHAIR SHACK: You'd still need DC power
9 for that to be useful, right?

10 MR. AVERETT: No.

11 CHAIR SHACK: No?

12 MR. AVERETT: It's not like they have W
13 pumps.

14 CHAIR SHACK: Not like the --

15 MR. SHAFER: It does have its own battery
16 bank and complete diesel, stand-alone diesel.

17 MEMBER SKILLMAN: Is that one each for
18 each plant?

19 MR. AVERETT: No, it's not. It's one big
20 one for both.

21 MEMBER SKILLMAN: A big one for two units?

22 MR. AVERETT: Yes.

23 MEMBER SKILLMAN: And a common header that
24 lets you direct water ever where you want it?

25 MR. AVERETT: Exactly.

1 MEMBER BROWN: How long can it run on its
2 own battery bank?

3 MR. SHAFER: Well, once the diesel starts,
4 it'll self-charge.

5 MEMBER BROWN: It's self-powered?

6 MR. SHAFER: That's correct, sir.

7 MEMBER BROWN: All right, so it's
8 basically a startup battery.

9 MR. SHAFER: That's correct, sir.

10 MEMBER SKILLMAN: How much fuel do you
11 have for that engine?

12 MR. SHAFER: It does have a skid tank on
13 it. I'm not sure what the duration is.

14 MEMBER SKILLMAN: Is it 24 hours, 72
15 hours, ten days?

16 MR. SHAFER: I think it's probably going
17 to be greater than 24 hours, but I could get back with
18 a specific number on it.

19 MEMBER SKILLMAN: Curiosity question.
20 Thank you.

21 MEMBER SIEBER: Does that diesel --

22 MR. SHAFER: No, it's a good question.

23 (Simultaneous speaking.)

24 MEMBER SIEBER: -- through any other
25 circuits in the plant?

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1 MR. SHAFER: No, sir. It's a stand-alone
2 day tank.

3 MEMBER SIEBER: Is it air-cooled or water-
4 cooled?

5 MR. SHAFER: Water-cooled radiator system.

6 MEMBER SIEBER: Essentially, a railroad
7 locomotive, right?

8 MR. SHAFER: Yes, sir.

9 MEMBER SIEBER: Okay.

10 MR. SHAFER: Tied to a pump, yes.

11 MEMBER SCHULTZ: Sam, I'm not sure of the
12 timing associated with the single-unit loss of offsite
13 power events. Has the station blackout cross-tie been
14 used, functionally used?

15 MR. SHAFER: Is it used? We do our PMS
16 every refueling outage. In addition to that, in a
17 similar scenario we're required annually for the
18 operators to test the time on that.

19 Our licensing commitment is once the
20 condition is recognized that we are able to cross-tie
21 within ten minutes, and we're very successful doing
22 that. All the controls are right in the control room.

23 MR. HALE: In fact, I believe we
24 demonstrated that through the ACRS Subcommittee
25 license renewal at Turkey Point. Remember, the

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1 Subcommittee came to the site?

2 MEMBER SIEBER: I remember.

3 MR. HALE: Yes, and station blackout was
4 coming up in terms of scope of license renewal.

5 CHAIR SHACK: That's right. That was a
6 contentious issue at that time.

7 MR. HALE: Right, and I believe we
8 demonstrated to the Committee. You all came to the
9 site, because we were the first Westinghouse plant.

10 MEMBER SIEBER: Yes, you had just had a
11 storm before that that did a lot of damage.

12 MR. HALE: Yes.

13 MR. AVERETT: Okay. Now, the last thing
14 that's somewhat unique to Turkey Point is we have
15 alternate cooling for the charging pumps, and this is
16 important from an RCP seal LOCA standpoint.

17 One of the classic RCP seal LOCA scenarios
18 is where you have a loss of CCW, which not only takes
19 out your charging pumps for seal injection, it also
20 takes out your seal cooling, which causes and RCP seal
21 LOCA, and you have CCW cooling the high-head safety
22 injection pumps, too, so you can see how the support
23 systems are going out there and causing problems.

24 In our case, we have alternate cooling
25 from the service water system for the charging pumps,

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1 and it is a proceduralized practice scenario and is
2 trained on, so if you have a loss of CCW, it doesn't
3 necessarily mean you're going straight to RCP seal
4 LOCA.

5 To address your concern about the low CDF,
6 it's my concern, as well, initially when it first came
7 out. What I did -- one thing I did was do a
8 sensitivity analysis. I took out credit for the
9 opposite unit RWST injection capability. I also took
10 out credit for station blackout cross-tie, and the
11 number went up to what is typically of Westinghouse
12 units like the low and mid E^{-5} range. Okay.

13 Also, I'd like to add that we had a team
14 from, I believe it was INL, for the SPAR model review
15 to sit down with us, and they had your concern, as
16 well. After they left, their number was about the
17 same as mine. And we have compared the cut sets from
18 similar plants like Robinson, and in each case where
19 there is a cut set that they have that I don't have,
20 it's design, based on the design difference.

21 Okay. The results of an internal event
22 analysis showed the CDF increase was about $5E^{-8}$ per
23 year, and the LERF increase was $4E^{-9}$ per year. This
24 is well below the Reg Guide 1174 guidelines, which
25 have a threshold for this significance of $1E^{-6}$ per

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1 year for CDF and $1E^{-7}$ for large early release
2 frequency.

3 One thing we did to minimize this risk
4 increase was we changed the set point for
5 implementation of bleed-and-feed cooling to a higher
6 steam generator level set point, raised it from 22
7 percent wide range to 33 percent wide range, which
8 helped out our human error for going to bleed-and-feed
9 cooling, gave the operator more time to do so. We've
10 already covered the second one about the RHR pumps.

11 So, just to summarize, the small increase
12 in risk due to EPU, it is positive, but it's well
13 below the guidelines in Reg Guide 1174. We made some
14 changes to minimize the risk from EPU, the ones I just
15 mentioned. I already covered the third bullet. The
16 baseline risk for Turkey Point is lower than average
17 based on unique design features, and that's all I
18 have.

19 MR. HALE: Any other questions from the
20 Committee?

21 MEMBER SCHULTZ: Mark, you just mentioned
22 that the set point for implementation of bleed-and-
23 feed cooling was increased and that that was an
24 assistance to the operational staff. Was that
25 identified previously? It certainly came up as an

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1 opportunity during uprate, but is that something that
2 you had on the books to change or examine because of
3 the operator action times?

4 MR. SHAFER: This is Sam Shafer from
5 Florida Power & Light. Not that I recall, sir. I
6 know that for EPU it's going to bring it up to 33
7 percent, but 22 is what we've been trained on and
8 what's standard for us.

9 MR. AVERETT: I think it actually was a
10 result of our initial results of the PRA. You know,
11 I think the increase was more than $5E^{-8}$, but it was
12 still less than $1E^{-6}$, but they asked us, "Well, what
13 can we do to lower it?" and I just looked at the top
14 cut sets, and I said, "Well, you know, if we had more
15 time to do this, that could have a good impact."

16 So they want something similar to St.
17 Lucie, and so we did it at Turkey Point, and I
18 factored that into the human liability analysis. Sure
19 enough, it made a substantial difference. I wish I
20 could tell you what the difference was, but it made a
21 non-negligible difference in the increase.

22 MEMBER SCHULTZ: Thank you.

23 MR. HALE: That's all we had, hopefully
24 clarified some of the questions we had from the full
25 Committee meeting. Okay, thank you.

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1 CHAIR SHACK: Just be prepared to repeat
2 it when John gets back.

3 MR. HALE: Okay. All right.

4 CHAIR SHACK: We're ahead of schedule
5 here, but I don't think anybody will object to taking
6 a little early break so we can do a changeover to go
7 to our proprietary session. So we'll be back at 9:35.

8 (Whereupon, the above-entitled matter went
9 off the record at 9:20 a.m. and resumed at 9:37 a.m.)

10 CHAIR SHACK: Okay. We're going to come
11 back into session now. Mr. Parks, I assume you'll
12 start the show.

13 MR. ULSES: Actually, Mr. Chairman, this
14 is Anthony Ulses. I'm the Branch Chief of Reactor
15 Systems. I just kind of want to introduce this topic
16 briefly. One thing I wanted to touch on, as well, a
17 little bit of the history and the time line here.

18 We know there have been some questions
19 about how we got to where we are, but what you're
20 going to hear from us today is a description of the
21 TCD impact on the specific field mechanical code, and
22 then we're going to -- then we're also going to
23 discuss how that impacts the downstream safety
24 analysis.

25 But to speak briefly about the history of

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1 where we are now, as we've heard from the members
2 today, this is not a new issue. You know, we've known
3 about thermal conductivity degradation for quite a
4 while.

5 What is new was the specific impact as you
6 work the effect of the phenomena all the way through
7 the entire evaluation model. We had never seen an
8 actual impact assessment in a quantitative fashion
9 until early December, and after we got that
10 information, we acted very aggressively.

11 We issued an Information Notice within
12 five days in order to get that information out to
13 licensees, and our expectation at that time was that
14 they would take that information, and they would look
15 at their regulatory requirements under 10 CFR 50.46,
16 and they would take action.

17 Up until about a week -- up until two or
18 three weeks ago, we had not seen any reports of
19 errors, as we would have -- as we would have expected
20 to have seen under 50.46. So, lacking that
21 information, we were compelled to issue a series of
22 50.54(f) letters, which are requests for information,
23 and those information requests are specifically
24 targeted at getting information to allow the staff to
25 verify compliance with 50.46 requirements.

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1 Again, ensuring compliance is a licensee
2 responsibility. Our role is to verify compliance,
3 and, you know, that again was an action that we took
4 very expeditiously after we got to the point where we
5 had not seen the information that we thought we were
6 going to get.

7 Again, this is all at the point that we're
8 trying to gather information so we can understand the
9 plant-specific impact of this error and so we could
10 ensure that the appropriate regulatory requirements
11 are being complied with.

12 So I just kind of wanted to go over
13 briefly the history of how we got to where we are
14 today, and as we heard from Mr. Howe this morning, the
15 answers to his letters are due by 19 March, and we'll
16 assess that information, and we'll act accordingly
17 after we get it.

18 MEMBER BANERJEE: So, Tony, what did you
19 see, and who did the analysis in December that brought
20 this to your attention?

21 MR. ULSES: Well, the actual -- the actual
22 specific utility is proprietary. I can answer the
23 question in, I'm assuming, a couple of minutes here
24 once we go into closed session.

25 MEMBER BANERJEE: All right.

1 MEMBER ARMIJO: Well, I have a --

2 MEMBER BANERJEE: We can address these
3 questions in closed session.

4 MEMBER ARMIJO: I have a -- I have a
5 broader question is it's obvious that the thermal
6 conductivity degradation will have a downstream effect
7 on your safety analyses, and when the -- so why did
8 the -- why was there such complacency in addressing
9 this problem?

10 You know, if you get new data to put into
11 your codes, you don't just stop with some very limited
12 fuel mechanical design issue. You take it all the way
13 down to the end of the line. It seems like this is a
14 problem that should have been addressed a long time
15 ago, and I don't understand what arguments there are
16 or basis for not doing it sooner.

17 MR. ULSES: Well, you know, I can't
18 specifically myself address the history of this issue,
19 but I can tell you that we have -- we did an
20 evaluation in 2009 when we issued the Information
21 Notice where we made the first -- you know, this is an
22 issue to licensees.

23 At the time, again, you know, we had not
24 done a -- we had not looked at the actual specific
25 impact on all of the analysis. That was more of a

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1 qualitative assessment, and our expectation, again,
2 was that licensees would take that information, and
3 they would take appropriate action, but I also think
4 you're going to hear a little bit of discussion on
5 this is that this is --

6 You know, there are -- there are many
7 competing effects, obviously, in all these analytical
8 tools, and it's not always entirely clear how the
9 impact is going to manifest itself as the overall
10 answer.

11 CHAIR SHACK: But still, it seems like it
12 should have been the first RAI you ask whenever you
13 get an EPU, and it's up to the licensee to defend the
14 result. I mean, it's not -- yours is to ask the
15 question, up to them to come up with a satisfactory
16 answer.

17 MR. ULSES: And we have asked RAIs on
18 this. You know, this particular EPU was not the first
19 point that we've actually addressed.

20 CHAIR SHACK: It's the first one we've
21 heard about.

22 MR. ULSES: It's the first one where we
23 had an issue.

24 CHAIR SHACK: Why wasn't this the first
25 RAI on this EPU? I mean, we heard about it at sort of

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1 the end of the process, rather than at the beginning.

2 MR. ULSES: Again, it's because of the
3 timing of the information received, and that was early
4 December, and that's unfortunately something we can't
5 control is when that information comes to us, but we
6 acted.

7 DR. WALLIS: Tony, have you seen the
8 letter from Sam Collins when he was the EDO, Jun 6,
9 2002, that said that PAD 4.0 TCD was a licensing
10 condition for this plant?

11 MR. ULSES: I actually have not personally
12 seen that.

13 DR. WALLIS: If that's a licensing
14 condition, why TCD wasn't in there right away, ten
15 years ago?

16 MR. ULSES: You know, I have not
17 personally seen that letter, but, again, this is not
18 a new phenomenon, as I said, and it's something that
19 we've known about for quite a while. The data, I
20 believe, was taken in 1996, I think, which has led to
21 all this effort.

22 MEMBER ARMIJO: I think Dr. Wallis'
23 question is more regulatory enforcement of a letter
24 written by the EDO that says, "Hey, this is a rule for
25 the road. Somehow it didn't get implemented."

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1 MEMBER BANERJEE: Well, you don't know it
2 was not implemented.

3 MEMBER ARMIJO: Well, here we are. It's
4 coming up as an issue.

5 MEMBER BANERJEE: Well, it's coming up an
6 issue, the EPU, right?

7 MEMBER ARMIJO: It was a licensing issue
8 before EPU.

9 MEMBER BANERJEE: Yes, it was the 2002
10 letter.

11 MEMBER ARMIJO: Right.

12 MR. ULSES: All I can offer on that at
13 this point is that we have undertaken an effort to
14 look at the extended condition of this issue, and
15 we're looking at it very aggressively, and there will
16 be more to come as we take a look into this.

17 MEMBER SIEBER: The Halden data is the
18 trigger.

19 CHAIR SHACK: Okay. Well, we can move on,
20 I think.

21 MEMBER REMPE: When you say that there is
22 more to come, could you elaborate? I mean, we're
23 going -- we're looking at the EPU now. Are you
24 planning to do more with --

25 MR. ULSES: I'm sorry. The question broke

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1 up, ma'am. Could you repeat that?

2 MEMBER REMPE: You said that you're
3 starting to look at this, and there will be more to
4 come. Are you talking about other plants or Turkey
5 Point?

6 MR. ULSES: Not for Turkey Point
7 specifically. As you're going to see here, we're
8 satisfied that Turkey Point has addressed this issue
9 technically. We're looking at a broader perspective,
10 looking across the industry to see how this may have
11 impacted other types of analyses and other areas of
12 regulatory compliance.

13 MEMBER REMPE: Okay.

14 DR. WALLIS: Well, why is it so
15 complicated for someone like Westinghouse to put this
16 information into a code and use it?

17 MR. CLIFFORD: I wouldn't -- I'll address
18 that. This is Paul Clifford. I wouldn't say it's
19 complicated, but it takes a lot of effort. It takes
20 a long time to calibrate a model, especially when
21 you're talking fuel temperature, because once you
22 change fuel temperature, you've got to go back and
23 recalibrate all of your other models, because
24 temperature is a driving force for so many other
25 phenomena that occur in the fuel rod.

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1 Then you need to validate those, and then
2 you need to document it, and then you submit it to the
3 NRC, and then the staff needs to review that. That
4 takes years of effort, and it's not like the industry
5 has been stagnant on this issue. I mean, we have
6 approved several codes.

7 DR. WALLIS: I don't understand. It's
8 just an input to a code.

9 MR. CLIFFORD: It's a model in a code.

10 DR. WALLIS: It's an input. You put in
11 the conductivity as it is.

12 MR. CLIFFORD: It's a model.

13 DR. WALLIS: And it's a function of
14 burnup. Maybe that's the problem. I would think it's
15 a one-liner. I mean, just put it in.

16 MEMBER BANERJEE: Well, but it also
17 affects fission gas, all sorts of things.

18 DR. WALLIS: It affects things, but
19 putting it in is not a problem. Putting it will put
20 the effects.

21 MEMBER BANERJEE: All the implications are
22 complicated.

23 DR. WALLIS: Seems like a homework problem
24 to me.

25 CHAIR SHACK: We're starting as sophomores

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1 again.

2 MR. CLIFFORD: Okay, I'll begin this
3 presentation describing the interim solution that FP&L
4 took to address thermal conductivity degradation.
5 That will involve a revision to the PAD4 code and some
6 benchmark calculations performed by the staff using
7 FRAPCON to verify the accuracy of the new version of
8 the code.

9 I'll be followed by Ben Parks, who will be
10 talking about the downstream effects, and, finally,
11 Shih-Liang Wu will talk about fuel seismic design
12 requirements.

13 MEMBER ARMIJO: Paul, before you go
14 forward, I want to back you up just a little bit. It
15 was these Halden experiments that really gave us
16 quantitative data on the degradation of -- thermal
17 conductivity degradation.

18 I re-looked at those documents, and the
19 highest burnup fuel rod that they tested, instrumented
20 fuel rod, was, I think, about 30,000 megawatts-day per
21 ton. Did they go higher than that? Did they go as
22 high as -- how high did they go?

23 MR. CLIFFORD: I know there are rods up
24 over 60 gigawatts-day.

25 MEMBER ARMIJO: Okay, so that was my big

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1 concern is that we cover the whole burnup range of
2 interest today.

3 MR. CLIFFORD: Right. Right, I could
4 provide you with the NUREG/CR-7022, which is the
5 FRAPCON validation, which describes the empirical
6 database for Halden.

7 MEMBER ARMIJO: You don't need to do that.
8 As long as it went up to a height of 60, 70 gigawatts-
9 day per ton, that makes me happy.

10 MEMBER BANERJEE: If I remember, though,
11 with the higher burnups it sort of flattens out,
12 right? The thermal conductivity comes --

13 MR. CLIFFORD: Yes, I have a slide on that
14 you'll see.

15 MR. KERSTING: This is Paul Kersting from
16 Westinghouse. The IFA 562 tests had burnups over
17 80,000, so they were fairly high burnup, and there are
18 other IFA series tests that also were up over 60,000
19 to 70,000.

20 MEMBER ARMIJO: Okay, good. Thank you.

21 MR. CLIFFORD: Okay. The original License
22 Amendment Request submitted by FP&L to support the
23 Turkey Point EPU used the approved version of PAD, PAD
24 4.0.

25 MR. WANG: Excuse me, Mr. Chairman. I

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1 think we are going to closed or -

2 MR. CLIFFORD: I think the next slide
3 starts. The next starts. Okay, so the original --
4 the currently approved version of PAD, PAD 4.0, does
5 not account for TCD.

6 In response to staff concerns in REIs,
7 FP&L proposed an interim solution whereby they would
8 modify the version of PAD and then use the modified
9 version of PAD for the fuel mechanical design and all
10 -- and to generate input to all downstream safety
11 analysis, for example, LOCA stored energy. That's an
12 interim path forward, and for the long term FP&L has
13 committed to implement the formal revision to PAD once
14 it becomes available.

15 CHAIR SHACK: Okay. I think we're going
16 to go into closed session now.

17 (Whereupon, the above-entitled matter went
18 off the record at 9:49 a.m.)

19

20

21

22

23

24

25

A large, decorative blue wave graphic that starts as a light blue shape on the left and curves upwards and to the right, ending as a solid dark blue shape on the right side of the slide.

Turkey Point Extended Power Uprate (EPU) ACRS Subcommittee

February 24, 2012

Agenda

- ➔ **Introduction Mike Kiley**
- **Status of Review..... Steve Hale**
- **Discussion Topics from ACRS Full Committee**
 - Loss of Load Overview..... Steve Hale
 - Loss of Off Site Power Overview..... Steve Hale
 - Shared Systems Overview..... Steve Hale
 - Probabilistic Safety Assessment Mark Averett

Turkey Point



- **FPL appreciates the opportunity to discuss the EPU License Amendment Request for Turkey Point with the ACRS Subcommittee**
- **Since the last ACRS Subcommittee and Full Committee meetings, FPL and NRC Staff have been working diligently to close the open items**
- **FPL recognizes and appreciates the importance of the Staff's questions, particularly those on Thermal Conductivity Degradation (TCD)**
 - NRC Staff performed a detailed review of FPL's analysis including a multi-day audit where FPL provided Staff with its analyses
 - This audit and the others performed by NRC Staff have been invaluable to the result of a thorough and comprehensive review of the proposed EPU
- **The open items have been addressed and FPL looks forward to answering any remaining questions**

Agenda

- Introduction Mike Kiley
- ➔ **Status of Review..... Steve Hale**
- **Discussion Topics from Full Committee**
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 - Shared Systems Overview..... Steve Hale
 - Probabilistic Safety Assessment Mark Averett

FPL provided responses to close the draft Safety Evaluation open items

- **At the ACRS Full Committee Meeting, there were 4 open items related to the Turkey Point EPU Safety Evaluation (SE)**
 - New Fuel Storage Area Technical Specification (TS)
 - Nuclear Fuel Thermal Conductivity Degradation (TCD)
 - Fuel Seismic/LOCA loading
 - I&C RAIs
- **FPL provided input to NRC Staff to address remaining open items, RAIs and actions from ACRS Meetings**
- **NRC Staff issued the revised draft SE**

Agenda

- Introduction Mike Kiley
- Status of Review..... Steve Hale



Discussion Topics from Full Committee

- Loss of Load Overview..... Steve Hale
- Loss of Off Site Power Overview..... Steve Hale
- Shared Systems Overview..... Steve Hale
- Probabilistic Safety Assessment Mark Averett

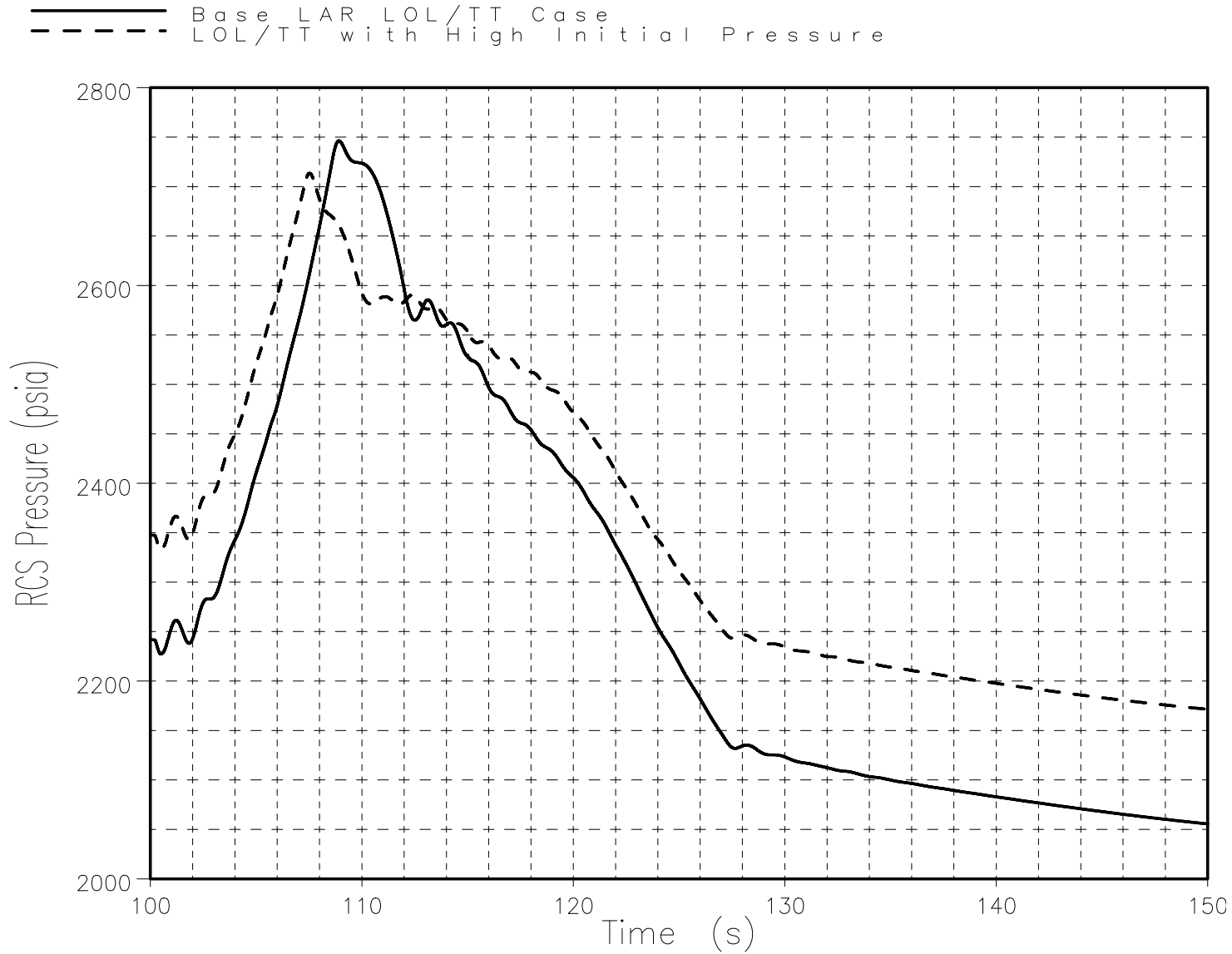
Loss of load analysis results assuming higher initial pressurizer pressure confirms lower pressure is conservative

- **Action Item – Perform loss of load analysis assuming nominal pressurizer pressure plus maximum pressure uncertainty vs. current analysis which assumes nominal pressurizer pressure minus maximum pressure uncertainty**

Event	Licensing Report Case	High Initial Pressurizer Pressure Case
	Time (sec.)	Time (sec.)
Loss of Load/Turbine Trip Initiated	0.0	0.0
High Pressurizer Pressure Reactor Trip setpoint (2455 psia) reached	6.3	4.9
Rod motion begins	8.3	6.9
Peak RCS pressure occurs	8.9 (2746.6 psia)	7.5 (2713.8 psia)

- **Results – Earlier reactor trip reduces severity**

Loss of load analysis results assuming higher initial pressurizer pressure confirms lower pressure is conservative



Agenda

- Introduction Mike Kiley
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Discussion Topics from Full Committee

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Although highly unlikely, dual unit loss of offsite power (LOOP) will not result in the pressurizer filling

- **Since 1990, only one dual-unit LOOP**
 - August 1992, as a result of Hurricane Andrew
 - Both units placed in a safe shutdown condition prior to onset of hurricane force winds
- **4 single unit LOOP events, 2 on each unit**
 - Caused by unit internal or switchyard faults/failures
 - Not initiated from the grid
- **Risk associated with a dual-unit LOOP**
 - Dual-unit LOOP frequency = 0.02 per year
 - CDF (dual-unit LOOP) = 8E-08 per year
- **Transient analysis demonstrates that the pressurizer will not fill with a LOOP**
 - Results are comparable to current licensing basis
- **No new Operator actions added for LOOP as a result of EPU**

Agenda

- Introduction Mike Kiley
- Background Steve Hale
- Status of Review..... Steve Hale

Discussion Topics from Full Committee

- Loss of Load Overview..... Steve Hale
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- Shared Systems Overview..... Steve Hale
- Probabilistic Safety Assessment Mark Averett

The shared systems provide flexibility and safety benefits

Shared Systems for Turkey Point Units 3 and 4

- **Emergency Core Cooling System**
 - 4 pumps which all start on SI signal from either unit
 - 2 required for LOCA, only 1 required for other events
 - Each pump aligned to separate emergency diesel generator
- **Auxiliary Feedwater System**
 - 3 turbine driven pumps
 - 1 required to satisfy heat removal requirements of both units
 - Capable of performing design function without AC power
 - 1 diesel driven standby feedwater pump
- **Emergency Diesel Generators (EDGs)**
 - 4 EDGs, 2 for each unit; all start on SI signal from either unit
 - EDGs can be cross tied from the Control Room
 - Each EDG has sufficient capacity to maintain both units in a safe shutdown condition

Agenda

- Introduction Mike Kiley
- Status of Review..... Steve Hale



Discussion Topics from Full Committee

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Probabilistic Risk Assessment (PRA) was used to calculate the EPU's impact on risk

PRA Risk Assessment of EPU

- **EPU is not a risk-informed submittal**
- **Risk impact of EPU was calculated using the Turkey Point dual-unit, internal events PRA model**
- **Internal Events PRA Model**
 - Updated in March 2010
 - Data current through December 31, 2006
 - Quantifies Core Damage Frequency (CDF) and Large Early Release Frequency (LERF)
- **Internal Flooding**
 - IPE screening analysis

The assessment also included external events and shutdown risks

PRA Risk Assessment of EPU - External Events / Shutdown Risk

- **External Events**
 - Seismic (low seismicity area, IPEEE walkdowns)
 - Internal Fire Events (IPEEE)
 - High winds, External floods, Transportation events (IPEEE)
- **Shutdown Risk**
 - Defense-in-depth
 - Implemented procedurally

The baseline models were updated for EPU conditions

Method

- **Updated Baseline Internal Events Models for EPU**
 - Logic models changed to reflect physical changes planned for EPU
 - Human Reliability Analysis (HRA) updated to reflect EPU-related timing changes
 - LOCA success criteria revised
 - Offsite power recovery credit revised to reflect EPU
- **External Events**
 - Assessed qualitatively
- **Shutdown Risk**
 - Assessed qualitatively

Turkey Point's CDF is lower than most Westinghouse units

Turkey Point Unique Safety Features

- Opposite-unit RWST injection capability
- Redundancy level of four for high-pressure injection for small-break LOCAs and bleed-and-feed cooling
- Station Blackout (SBO) Crosstie
- Diesel-driven Standby Steam Generator Feedwater (SSGFW)
- Alternate cooling for charging pumps

Removing credit for opposite-unit RWST injection and SBO crosstie results in a higher CDF which is more typical of Westinghouse units

The results indicate a slight increase in risk from an already low baseline (pre-EPU) risk

Results

- **Slight increase in Risk**
 - CDF increase of $5E-08$ per year
 - LERF increase of $4E-09$ per year
- **Risk increase is well below the NRC Reg Guide 1.174 thresholds for risk significance of plant changes**
- **Changes to minimize Risk increase:**
 - Setpoint for implementation of bleed-and-feed cooling was increased from a SG level of 22%WR to 33%WR.
 - Procedure step to shut off RHR pumps in the event of a LOCA where pressure remains high was moved to a point earlier in the procedure.

The small increase in risk is considered non-risk-significant per the guidelines in Reg Guide 1.174

Summary

- **There was a small increase in risk due to EPU**
- **Some changes were made to minimize the risk from EPU**
- **Risk increase is well below the NRC Reg Guide 1.174 thresholds for risk significance of plant changes**
- **Baseline risk for Turkey Point is lower than average**
- **Unique crossties and redundancies are the reasons for the lower risk values**

Introduction

Allen G. Howe

Deputy Division Director

Division of Operating Reactor Licensing

Office of Nuclear Reactor Regulation

Jason C. Paige

Project Manager

Division of Operating Reactor Licensing

Office of Nuclear Reactor Regulation

Introduction

- Background
 - ❖ TP EPU Application – October 21, 2010
 - ❖ 2300 to 2644 MWt, 15 % increase (344 MWt)
 - Includes a 13 % power uprate and a 1.7 % MUR
 - 20 % increase above original licensed thermal power
- EPU Review Schedule
 - ❖ Followed RS-001
 - ❖ Linked licensing actions
 - AST – approved June 23, 2011
 - SFP Criticality analysis – approved October 31, 2011
 - ❖ Supplemental responses to NRC staff RAIs and Audits

Open Items From January 19, 2012 ACRS Full Committee meeting

- Thermal Conductivity Degradation
- Fuel System Design, Grid Crush
- I&C Uncertainty Allowance Values
- New Fuel Storage EPU TS supplement

Topics for Subcommittee

- EPU Overview
- Discussion Topics from ACRS Full Committee Meeting
 - ❖ Loss of Load Overview
 - ❖ Loss of Offsite Power Overview
 - ❖ Shared Systems Overview
 - ❖ Probabilistic Safety Assessment
- Thermal Conductivity Degradation
- Fuel System Design, Grid Crush



Turkey Point EPU LAR Review:
Fuel Thermal Conductivity Degradation

February 24, 2012

Paul Clifford, Benjamin Parks, Shih-Liang Wu
Division of Safety Systems
Office of Nuclear Reactor Regulation

Agenda

1. TCD Interim Solution
2. PAD4TCD Thermal Conductivity Model
3. Benchmark Calculations
4. Downstream Safety Analysis Impact
5. Westinghouse ASTRUM Revisions

TCD Interim Solution

- Turkey Point EPU LAR employed Westinghouse PAD 4.0 fuel rod performance code
 - ❖ Approved version of PAD 4.0 does not account for thermal conductivity degradation (TCD) with exposure
- In response to staff concerns, FPL proposed an interim solution involving a modified version of PAD which properly accounts for TCD
 - ❖ Modified PAD replaced PAD 4.0 for fuel thermal-mechanical design analysis and input to downstream analyses (e.g., LOCA stored energy)
 - ❖ FPL has provided a commitment to implement the formal revision to PAD once it becomes available