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COMMITTEE ON REACTOR SAFEGUARDS

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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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MEETING OF THE POWER UPRATE SUBCOMMITTEE

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WEDNESDAY,

MARCH 3, 2010

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ROCKVILLE, MARYLAND

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The Advisory Committee met, at the Nuclear
Regulatory Commission, Two White Flint North, Room
T2B3, 11545 Rockville Pike, at 8:30 a.m., Sanjoy
Banerjee, Subcommittee Chairman, presiding.

ACRS MEMBERS:

SANJOY BANERJEE, Subcommittee Chairman

SAID ABDEL-KHALIK, ACRS Chairman

J. SAM ARMIJO, ACRS Vice Chairman

MARIO V. BONACA, Member

HAROLD B. RAY, Member

JOHN D. SIEBER, Member

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ACRS CONSULTANTS PRESENT:

THOMAS DOWNAR

GRAHAM B. WALLIS

ACRS STAFF PRESENT:

ZENA ABDULLAHI, Designated Federal Official

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

Call to Order and Welcoming Remarks 4

Chairman Sanjoy Banerjee

Staff Introduction 7

S. Philpott, NRR

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

8:30 a.m.

SUBCOMMITTEE CHAIRMAN BANERJEE: So, the meeting will now come to order.

This is a meeting of the Power Uprate Subcommittee. I'm Sanjoy Banerjee, Chairman of the Subcommittee meeting.

ACRS members in attendance are Said Abdel-Khalik, Sam Armijo, Mario Bonaca, Jack Sieber, Harold Ray, but there is no John Stetkar, who was supposed to be here.

Our ACRS consultants who will help us with this review are Graham Wallis, a former Chair of the ACRS, and Tom Downar, Zena Abdullahi of the ACRS staff, who is the Designated Federal Official for this meeting.

As many of you may recall, May, around the 24th, 25th, 2007, there was a Subcommittee meeting and later, on June 6th, 2007, a full Committee meeting, where we reviewed the GEH Topical Report NEDC-33173-PA, Applicability of GE Methods to Expanded Operating Domains, Methods LTR, and NEDC-33006-PA, Revision 3, General Electric Boiling Water Reactor Maximum Extended Load Line Limit Analysis Plus, MELLLA+. I had the pleasure of being the Chairman of

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1 that Subcommittee, too.

2 In a June 22, 2007, letter report, ACRS
3 recommended that the two topical reports be approved.

4 In today's Subcommittee meeting, we will
5 be reviewing Supplement 3 to NEDC-33173-P. This
6 supplement extends the Interim Methods Topical Report
7 to GNF2 fuel designs.

8 GEH requested, and the staff approved, the
9 adequacy of the GEH codes and the associated
10 methodologies to be applied to the new GNF2 fuel
11 designs for operations in the expanded domain.

12 The Interim Methods Topical Report
13 provided the basis for application of fuel designs up
14 to GE14, fuel design for operation in the MELLLA+
15 operating domain.

16 It is important to note that there is
17 significant operating experience with cores loaded
18 with GE14 fuel design, including operation at 20
19 percent uprate above the original licensed thermal
20 power. Our task will be to determine if the staff's
21 conclusion in the review of NEDC-33173-P, which was
22 specifically based on the fidelity of GEH codes to
23 fuel designs up to GE14, are applicable to cores
24 loaded with GNF2 fuel designs.

25 We expect to hear about the design

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1 features and performance of the GNF2 fuel relative to
2 the GE14 fuel designs. We will hear presentations
3 from the NRC staff and GEH. The Subcommittee will
4 gather information, analyze relevant issues and facts,
5 and formulate proposed positions and actions, as
6 appropriate for deliberation by the full Committee.

7 We have received no requests from the
8 public to make a statement at today's meeting.

9 Part of the meeting will be closed because
10 details of GEH's proprietary information will be
11 discussed. The Subcommittee agenda that is available
12 in this meeting room delineates which segments of the
13 meeting will be closed.

14 The rules for participation in today's
15 meeting have been announced as part of the notice of
16 this meeting previously published in The Federal
17 Register. A transcript of the meeting is being kept
18 and will be available, as stated in The Federal
19 Register notice.

20 Therefore, we request that participants in
21 this meeting use the microphones located throughout
22 the meeting room when addressing the Subcommittee.
23 The participants should, first, identify themselves
24 and speak with sufficient clarity and volume, so that
25 they may be readily heard.

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1 I would actually like to say something to
2 compliment GE on taking this approach of submitting
3 these comprehensive topical reports for us to look at
4 and, hopefully, approve, which I think is a very nice
5 systematic way to proceed with these new designs and
6 uprates and expanded domains.

7 In any case, we will now proceed with the
8 meeting, and I call upon Steve Philpott to begin.

9 MR. PHILPOTT: Good morning, everyone.
10 Thank you for having us.

11 As the Chairman mentioned, my name is
12 Steve Philpott. I am project manager in the newly-
13 renamed branch, the Licensing Processes Branch. We
14 are in the Division of Policy and Rulemaking in the
15 Office of Nuclear Reactor Regulation, and we manage
16 the topical report review process.

17 So, my intention here is to give you a
18 brief introduction because I understand what you are
19 probably most interested in is talking about and
20 getting into the meat of the review and that sort of
21 thing. But we did feel that it was important to do a
22 bit of a brief introduction to tell you a little bit
23 about, just explain what Supplement 3 is to the
24 Interim Methods Topical Report.

25 Because the Interim Methods, there's a

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1 series or a process of getting to what we think of as
2 final methods, that it can be a bit cumbersome to
3 understand where we are going or why we have all these
4 supplements, and that sort of thing.

5 So, there's a few slides that you should
6 have copies of, I think 10 or 11 slides, but I plan to
7 go through them fairly briefly.

8 I want to start off with just a quick
9 background of some general dates. I think you have
10 already mentioned that you saw the Interim Methods and
11 the MELLLA+ reviews a couple of years ago, in the
12 middle of '07 I believe that was, so coming up on
13 three years ago.

14 But this is just a timeline, background,
15 initially starting with the MELLLA+ submittal in '02,
16 but it was revised and submitted again in 2005 and, as
17 you mentioned, you reviewed those topical reports.
18 That went along with the Interim Methods Topical
19 Report, which was submitted in '06, and you saw those
20 in 2007. It was being approved and issued in '07 and
21 early 2008. Mentioned a couple of the early power
22 uprate submittals, Vermont Yankee and Browns Ferry as
23 well.

24 We did swap in your slides, and I
25 apologize. There's two slides that we just switched

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1 places. I think this is the one. Actually, the third
2 slide in your packet is the second slide here.

3 This is just showing you a little bit
4 about, we wanted to just briefly mention plants that
5 have referenced the Interim Methods Topical Report so
6 far, the first one being Hope Creek that submitted in
7 2006. That one was approved, and I believe you
8 reviewed that approval as well.

9 Monticello and Nine Mile Unit 2 have also
10 submitted their EPUs referencing IMLTR that are still
11 currently under review. Monticello has also recently
12 submitted a MELLLA+ License Amendment Request that
13 references the Interim Methods.

14 SUBCOMMITTEE CHAIRMAN BANERJEE: Are these
15 all 20 percent, the Nine Mile Point as well?

16 MR. PHILPOTT: I don't know exactly what
17 -- I will have to find that out for you, to tell you
18 the truth.

19 SUBCOMMITTEE CHAIRMAN BANERJEE: That's
20 okay.

21 MR. PHILPOTT: I don't believe they are
22 all 20 percent, but I don't know exactly what.

23 MR. HARRISON: Steve?

24 MR. PHILPOTT: Yes?

25 MR. HARRISON: We can answer that, if you

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1 want.

2 MR. PHILPOTT: Yes.

3 MR. HARRISON: Jim Harrison from GE here.

4 Hope Creek is 115 percent. Perhaps you
5 knew that. And Monticello and Nine Mile are both 120.

6 MR. PHILPOTT: So, I think this skips back
7 to the second slide in your packet. This is just,
8 again, I want to just briefly explain the process and
9 try to eliminate some confusion. There's several
10 slides here that are going to step through what all
11 these different limitations and appendices are to
12 Interim Methods, the process that GE is going to
13 follow.

14 Hopefully, when we see you again on
15 subsequent supplements, I will condense that down into
16 a more brief appearance, that sort of thing, but we
17 wanted to give you some details on what each of these
18 is.

19 The Interim Methods Safety Evaluation, we
20 imposed 24 limitations with that safety evaluation for
21 the power uprate and MELLLA+ applications. GE-Hitachi
22 has committed to address a number of those limitations
23 by submitting some additional data to address some of
24 the federal needs that were imposed. There were
25 adders that were imposed in some of those limitations.

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1 So, what we have is a process of a series
2 of supplements to the Interim Methods Topical Report
3 that are intended to address particular limitations.

4 ACRS VICE CHAIRMAN ARMIJO: Steve, before
5 you go too far, what is interim about these Interim
6 Methods? Is it because they are interim for a time or
7 will they be replaced by some other method?

8 MR. PHILPOTT: Well, for now, it is my
9 understanding that, you know, initially, it was
10 submitted as the GE methods, and I think, through the
11 process of having these limitations and wanting to
12 further address some of the limitations at least, I
13 think we refer to them as Interim Methods. Probably
14 GE can speak to that more specifically.

15 But, eventually, I believe their intention
16 is that there will be other methods that will replace
17 these methods at some point. But, for the foreseeable
18 future, we are calling them interim because there's a
19 series of steps to eliminate some of these limitations
20 that get us to what we refer to as the Final Methods.

21 ACRS VICE CHAIRMAN ARMIJO: Okay. Thank
22 you.

23 MR. PHILPOTT: And I think you will see
24 that a little bit as we show you what all the
25 different supplements are.

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1 So, one of the questions may be, okay,
2 Supplement 3 is the first supplement that you are
3 seeing since the Methods Topical Report came through,
4 and you may say, well, why are we up to Appendix K
5 already? That is because we have kind of slotted
6 appendix names for certain different submittals and
7 that sort of thing. So, Appendix F is already a part
8 of the Methods Topical Report, and that was where we
9 just did a review of GE's Part 21 evaluation. We just
10 ran fuel thermal conductivity models.

11 Appendix G is where they committed to
12 address the outstanding RAIs, kind of left over from
13 the MELLLA+ review, which those are open RAIs.
14 Appendix G will document the closure of those RAIs
15 that are still open, but are covered by penalties and
16 limitations that were imposed on the MELLLA+ in
17 Interim Methods.

18 Supplement 1 is where -- and again, I
19 guess before I go a little bit further, I do want to
20 emphasize, I am going to step through briefly because
21 I don't know that you want to review each of these
22 supplements in too much detail. But I want to
23 emphasize again, the point of being here today is for
24 Supplement 3 and Appendix K. But this is hoping to
25 give you an overall picture of what the supplements

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1 are and where we intend to go with the methods.

2 So, Supplement 1, quickly, we've got to
3 qualify the void quality correlation by submitting
4 pressure drop data and some COBRAG analyses. Again,
5 this is the first one that is intended to remove one
6 of those adders, an OLMCPR adder.

7 CONSULTANT WALLIS: Is it appropriate for
8 me to ask? I mean this is all indirect. The void
9 quality correlation is verified by pressure drop data
10 and comparison with another code, but there is no
11 direct measurement of voids. Is that right?

12 MR. PHILPOTT: I believe that is true, but
13 I will probably have to refer to Peter Yarsky maybe,
14 who is doing the review and is more familiar with how
15 they plan to do that.

16 DR. YARSKY: Yes, this is Dr. Peter Yarsky
17 speaking.

18 The approach that is taken in Supplement 1
19 is consistent with an approach described in the MFN
20 letter that we have referenced here, MFN 06-435. I
21 don't want to get too much into the details of the
22 approach taken in Supplement 1, predominantly because
23 we are trying to focus on Supplement 3.

24 But if you want to look at the details of
25 what was agreed upon by the staff and what is

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1 documented in the IMLTR SE, we have put the MFN letter
2 reference number on the slide. I am not sure to what
3 degree the approach that GEH takes would be considered
4 proprietary.

5 SUBCOMMITTEE CHAIRMAN BANERJEE: If you
6 want, you can address it again in the closed session.

7 CONSULTANT WALLIS: I think we are going
8 to get to this later.

9 SUBCOMMITTEE CHAIRMAN BANERJEE: Yes.

10 CONSULTANT WALLIS: Yes.

11 MR. PHILPOTT: Okay. Supplement 2, this
12 is where GE is meeting their commitment to qualify
13 methods. They have submitted pin and bundle gamma
14 scan data. This was already submitted late last year,
15 August of last year. So, it is currently under
16 review. And this is, again, addressing these
17 penalties, these adders for SLMCPR, the safety limit
18 for .02 or .03 for EPU and MELLLA+ applications.

19 Appendix J refers to RAI 9. And again,
20 this is fission gas and fuel exposure gamma scans.
21 And again, this is to fulfill a commitment. It also
22 relates to Limitation 12 from the Interim Methods SE.

23 SUBCOMMITTEE CHAIRMAN BANERJEE: Is that
24 limitation on the burnup limitation or what was it?
25 I'm trying to remember what it was.

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1 MR. PHILPOTT: No, this is not the burnup
2 limitation. Limitation 12 deals with the thermal-
3 mechanical methods.

4 SUBCOMMITTEE CHAIRMAN BANERJEE: Oh, it is
5 just with use of PRIME.

6 MR. PHILPOTT: Use of PRIME, exactly.
7 Exactly, yes. In fact, this will be submitted on the
8 PRIME docket, as I understand.

9 And the commitment to PRIME actually was
10 recently approved, and the commitment to use PRIME in
11 future applications.

12 And again, this one will be, they will
13 submit the data to us, and our plan is to examine that
14 data, to confirm that they have met their commitment
15 to submit this data, as a confirmation of the efficacy
16 of PRIME.

17 Supplement 3, we highlighted in red, just,
18 again, to emphasize -- we didn't highlight it in the
19 printout. So, we thought to do that after we printed
20 them.

21 But, again, just to emphasize, this is
22 where today's review fits. This one just, basically,
23 takes the Interim Methods approval, which was, as you
24 mentioned before, limited to GE14 and earlier fuels,
25 and looks at that to extend that applicability to

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1 GNF2.

2 Supplement 4 has also already been
3 submitted. And this is where GE submitted their plan
4 for migrating to PRIME, the PRIME thermal gamma
5 methods. That was submitted last year, and we are in
6 the process of that review. Once that is approved,
7 that will be confirmed with an audit.

8 Then, the last two supplements that were
9 appendices, I guess I should say, that we are going to
10 highlight today, Appendix M and Appendix N. The first
11 one is a commitment to submit the MELLLA+ eigenvalue
12 tracking data. This was the Monticello. As I
13 mentioned before, the MELLLA+ License Amendment
14 Request was submitted earlier this year in January.
15 So, they intend to meet that with data that they get
16 from the Monticello application.

17 Then, Limitation 13 for the Interim
18 Methods, Appendix N, this is, should they want to go
19 to designs with greater than 10 percent gadolinia.

20 So, again, back to Supplement 3, this is
21 really the crux of the issue for today. That is,
22 again, addressing this Limitation 22 in the Interim
23 Methods Safety Evaluation, is the limitation limited
24 to GE14 and earlier fuels. So, Supplement 3 has been
25 reviewed to considering the application to GNF2.

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1 We did want to emphasize that it does not
2 request any removal of any other limitations, any
3 adders or penalties, that sort of thing. It merely
4 addresses this Limitation 22, the limitation on the
5 fuel applications.

6 SUBCOMMITTEE CHAIRMAN BANERJEE: Well,
7 there's no additional adders, though.

8 MR. PHILPOTT: No, not as a result of this
9 review, exactly, which GE is probably happy about,
10 yes.

11 SUBCOMMITTEE CHAIRMAN BANERJEE: Yes, I'm
12 sure.

13 (Laughter.)

14 MR. PHILPOTT: Any other questions? I
15 think this is going to be the extent of the open
16 session for today.

17 ACRS VICE CHAIRMAN ARMIJO: The burnup
18 limit that is currently in place for GNF2, where will
19 that be addressed, in Supplement 3 or one of the
20 further future supplements?

21 DR. YARSKY: Well, we are going to address
22 that in the closed session.

23 ACRS VICE CHAIRMAN ARMIJO: Okay.

24 SUBCOMMITTEE CHAIRMAN BANERJEE: Okay.
25 So, I think we should, then, go into closed session

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1 and, Steve, you will continue. We will have to make
2 sure that anybody who shouldn't be in the room isn't
3 in the room.

4 MR. PHILPOTT: Okay. Well, those are all
5 the comments that I have.

6 SUBCOMMITTEE CHAIRMAN BANERJEE: All
7 right.

8 MR. PHILPOTT: Actually, I think we are
9 going to try to go over to GE --

10 SUBCOMMITTEE CHAIRMAN BANERJEE: Okay.
11 So, GE will take the floor at the moment.

12 We just need to ensure that -- and we also
13 need to get the closed line up.

14 So, are we going to be ready to go into
15 closed session now? Everybody has been cleared?

16 (Whereupon, at 8:51 a.m., the proceedings
17 went into closed session.)

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Protecting People and the Environment

**NRC Staff Review of
NEDC-33173P, Supplement 3
“Supplement for GNF2 Fuel”**

Stephen Philpott

NRR/DPR/PLPB

Background

- Jan 2002 - MELLLA+ LTR submitted
- Sep 2003 - VYNPS EPU LAR submitted
- Jun 2004 - BFN1 EPU LAR submitted
- Nov 2005 - M+LTR Rev. 2 submitted
- Feb 2006 - Interim Methods LTR submitted
- Sep 2007 - M+LTR approved
- Jan 2008 - IMLTR SE issued 1/08

IMLTR Plant Licensing History

- EPU LARs referencing the IMLTR
 - Hope Creek (BWR/4)
 - 9/06 submitted
 - 5/08 approved
 - Monticello (BWR/3)
 - 11/08 submitted
 - Nine Mile Point Unit 2 (BWR/5)
 - 5/09 submitted
- MELLLA+ LARs referencing the IMLTR
 - Monticello (BWR/3)
 - 1/10 submitted

Interim Methods Process

- IMLTR SE imposes 24 limitations for EPU and MELLLA+ applications
- GE-Hitachi (GEH, previously GE) has committed to provide additional data to address several limitations as supplements to the IMLTR

Final Methods Roadmap

- **GSTRM Part 21 (SE Appendix F)**
 - Staff audited revised GE14 compliance documents to address findings related to the GSTRM Part 21 evaluation.
- **Outstanding methods related RAI responses (SE Appendix G)**
 - GEH committed to address outstanding methods RAIs

Final Methods Roadmap

- Supplement 1 (SE Appendix H)
 - GEH commitment to qualify the void-quality correlation (MFN 06-435)
 - Pressure drop data and COBRAG analyses to be submitted
 - Supplement 1 is intended to provide data to remove the OLMCPR 0.01 adder

Final Methods Roadmap

- Supplement 2 (SE Appendix I)
 - GEH commitment to qualify the nuclear methods (MFN 06-434)
 - Pin and bundle gamma scan data submitted August 14, 2009
 - Supplement 2 is in 3 parts and is intended to remove the SLMCPR adder (0.02 or 0.03)

Final Methods Roadmap

- IMLTR RAI 9 (SE Appendix J)
 - GEH committed to provide plenum fission gas and fuel exposure gamma scans (MFN 06-481)
 - To be submitted as a supplement to the PRIME LTRs
 - NRC Staff will examine to confirm the commitment has been satisfied

Final Methods Roadmap

- **Supplement 3 (SE Appendix K)**
 - IMLTR restricted to GE14 and earlier GE fuel
 - Supplement 3 extends approval to GNF2 fuel
- Supplement 4 (SE Appendix L)
 - GEH committed to migrate to PRIME T-M methods (MFN 09-143)
 - Supplement 4, submitted July 10, 2009, describes a process for migration
 - SE Appendix L will be supplemented by an NRC audit of the final implementation

Final Methods Roadmap

- IMLTR SE Limitation 23 (SE Appendix M)
 - MELLLA+ eigenvalue tracking data for first MELLLA+ plant
 - Monticello MELLLA+ LAR submitted Jan 2010 (licensee intends to comply with this limitation)
- IMLTR SE Limitation 13 (SE Appendix N)
 - Supplement required for application to gadolinia loading greater than 10 weight percent.

Supplement 3: GNF2 Supplement

- IMLTR SE Limitation 22 restricts the IMLTR applicability to GE14 and earlier GE fuel designs
- Supplement 3 extends IMLTR applicability to the GNF2 fuel design
- Does not request removal or modification of any IMLTR limitations besides extension to a fuel design beyond GE14