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OPEN SESSION WITH OPEN SLIDES

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16
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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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THERMAL-HYDRAULIC PHENOMENA SUBCOMMITTEE

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OPEN SESSION

+ + + + +

MONDAY

SEPTEMBER 19, 2016

+ + + + +

ROCKVILLE, MARYLAND

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The Subcommittee met at the Nuclear Regulatory Commission, Two White Flint North, Room T2B1, 11545 Rockville Pike, at 8:33 a.m., Michael Corradini, Chairman, presiding.

COMMITTEE MEMBERS:

MICHAEL L. CORRADINI, Chairman

RONALD G. BALLINGER, Member

JOY REMPE, Member

MATTHEW W. SUNSERI, Member

ACRS CONSULTANT:

ROHATGI UPENDRA

DESIGNATED FEDERAL OFFICIAL:

ZENA ABDULLAHI

ALSO PRESENT:

JOHN FIELDS, Xcel Energy*

PETER GARDNER, Xcel Energy

ROB KUNTZ, NRR

TAMARA MALANEY, Xcel Energy

ERIC OESTERLE, NRR

MATTHEW PANICKER, NRR

DIEGO SAENZ, NRR

RICK STADTLANDER, Xcel Energy

DANIEL TINKLER, AREVA

*Present via telephone

A-G-E-N-D-A

ACRS Chairman Opening Remarks. 4

Michael L. Corradini, ACRS

Staff Opening Remarks. 7

Rob Kuntz, NRR

Technical Review Remarks. 15

Eric Oesterle, NRR

MNGP Licensing for EFW Operation. 18

Peter Gardner, Xcel Energy

Analysis Overview, Implementation 21

Tamara Malaney, Xcel Energy

Effect on Operations. 56

Rick Stadtlander, Xcel Energy

Methods Applicability, Results. 67

Tamara Malaney, Xcel Energy

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

2 8:33 a.m.

3 CHAIRMAN CORRADINI: The meeting will

4 come to order. This is a meeting of the

5 Thermohydraulics Subcommittee of the Advisory

6 Committee on Reactor Safeguards.

7 My name is Mike Corradini, I'm chair of

8 the subcommittee today. ACRS members in attendance

9 are Ron Ballinger, Matt Sunseri and Joy Rempe. We

10 also have with us today, Kumar Upendra, our

11 consultant and Dr. Smith is going to join us on the

12 phone, eventually, for most of the day, except for

13 other intermittent periods.

14 Ms. Zena Abdullahi is the designated

15 federal official for this meeting. In today's

16 meeting, Xcel Energy, the licensee of Monticello,

17 will brief us on their licensing amendment request

18 proposing operation of Monticello in the extended

1 flow window domain using AREVA's methodology.
2 Monticello was authorized to operate at
3 the maximum extended load line limit analysis, so
4 called MELLLA+, which is the same power flow domain
5 as the EFW.
6 The approval of operating Monticello at
7 the MELLLA+ domain with GEH fuel and methods was
8 analyzed as part of a plant-specific basis, and was
9 supported by a number of generic topical reports.
10 Monticello was one of the first plants
11 that NRC approved for the operation of MELLLA+.
12 And in today's meeting, the staff, Xcel Energy as
13 licensee, and their reload vendor, will address
14 plant-specific bases on three areas - applicability
15 of AREVA's analytical methods and code sweep to
16 operation in the EFW domain, Monticello's analysis
17 of their operation at EFW for transition core and
18 full core loaded with AREVA's ATRIUM 10X fuel
19 design.
20 And we'll also discuss what analysis,
21 aside from the regular reload, would be performed
22 for EFW operation on a cycle-specific basis. We
23 look forward to discussing the experimental data
24 also available to demonstrate the fidelity of
25 AREVA's methods, particular in the ATWS-I region.

1 Part of this subcommittee's meeting is
2 closed to the public in order to protect
3 information that is proprietary for AREVA, and GEH
4 as well. During the closed portion of the meeting,
5 we request that Xcel Energy and AREVA staff survey
6 the attendee's in the room and ensure that all of
7 the participants are cleared for access to their
8 proprietary information.
9 As the meeting is being transcribed, I
10 request that participants in this meeting use the
11 microphones located throughout the room when
12 addressing the subcommittee.
13 Participants should identify themselves
14 and speak with sufficient clarity and volume, so
15 that they may be readily heard. I'd also ask
16 everybody to please check their various appliances
17 to make sure they're put on mute so we don't hear
18 any dinging or ringing or banging during the
19 meeting.
20 Also, there is a closed line that we'll
21 open up shortly for the AREVA and Xcel Energy's
22 subject matter experts that'll be on through the
23 day. The open line will be open through the open
24 session of the meeting.
25 We'll go to comments from the public

1 after Xcel Energy's presentation, which is open.
2 And then go into closed session the rest of the
3 day. So let me now proceed and call upon the
4 project manager.
5 Eric, are you going to kick us off, or
6 is Rob? I'm sorry. So I call on project manager
7 Rob Kuntz.
8 MR. KUNTZ: Good morning, thank you,
9 Chairman.
10 CHAIRMAN CORRADINI: Is your light
11 green?
12 MR. KUNTZ: Yes, my light is green.
13 Can you hear me?
14 CHAIRMAN CORRADINI: There you go.
15 MR. KUNTZ: Does that work? My name is
16 Rob Kuntz. I'm the Monticello project manager in
17 the Division of Operating Reactor Licensing at NRR.
18 And we'll just quickly go over some background on
19 the Monticello EFW licensing amendment request.
20 Just a quick background of the
21 licensing history for Monticello. They were
22 approved for extended power uprate in December of
23 2013. As the chairman had mentioned, they were
24 approved for MELLLA+ in March of 2014.
25 There was a separate amendment that was

1 requested and approved for transition to AREVA
2 fuels, and that was in the summer of last year.
3 And this application for the extended flow window
4 came in at October of 2014 as the first extended
5 flow window license amendment request that's been
6 received.
7 CHAIRMAN CORRADINI: Just a
8 clarification. The transition AREVA fuel was
9 approved, but they had to go back to MELLLA
10 operation. Is that correct?
11 MR. KUNTZ: Correct.
12 MR. SAENZ: Well they didn't back to
13 MELLLA operation, but the approval was for MELLLA
14 operation and EPU conditions.
15 CHAIRMAN CORRADINI: Correct, I should
16 have said it that way.
17 MR. SAENZ: That's right.
18 CHAIRMAN CORRADINI: But not MELLLA+?
19 MR. SAENZ: That's right. It did not
20 include MELLLA+ operation.
21 CHAIRMAN CORRADINI: Okay, thank you.
22 MR. KUNTZ: In August of this year, we
23 issued the draft safety evaluation. And it did not
24 contain any open items at that point. We've since
25 gotten a supplement from the licensee, on Wednesday

1 of last week, that addressed two items - one's the
2 safety minimum critical power ratio. And, as
3 discussed in the SE, the staff believed that there
4 was still a need to impose the penalty of .03.
5 That supplement we just got addresses
6 that penalty in the technical specification
7 modification that was proposed. And the other
8 limitation was 9.23, and that was to provide
9 Eigenvalue tracking data to be submitted to the
10 NRC.
11 Originally, the licensee had said this
12 condition was applicable. They're now saying that
13 it is not applicable because the operating
14 conditions at Monticello - it's not necessarily
15 beneficial to have that submitted.
16 So we just got that in Wednesday of
17 last week. We're still reviewing that supplement,
18 and it should be small modifications to the SE,
19 potentially.
20 CHAIRMAN CORRADINI: So let me make
21 sure I understand.
22 MR. KUNTZ: Yes.
23 CHAIRMAN CORRADINI: So the first sub
24 bullet, they're looking to remove the penalty? Or
25 justify the penalty in post? I'm trying to

1 understand.

2 MR. SAENZ: Diego Saenz. The licensee

3 had requested that the penalty be removed. Staff

4 felt that there wasn't sufficient information to

5 remove the penalty at this time.

6 So we concluded that it should remain.

7 But the licensee had requested that it be removed.

8 CHAIRMAN CORRADINI: And they've now

9 come back with technical information for justifying

10 the removal?

11 MR. SAENZ: So, now they've

12 supplemented, and proposed a method to maintain

13 that penalty. So the original LAR requested a

14 removal. This amendment would maintain that

15 penalty.

16 CHAIRMAN CORRADINI: Let's just back

17 up.

18 MR. SAENZ: Yes.

19 CHAIRMAN CORRADINI: So, right now,

20 their submission in your SER already -- the draft

21 SER that I was reading imposed the penalty or kept

22 the penalty there?

23 MR. SAENZ: That's right. The staff's

24 conclusion was that it was appropriate to maintain

25 that penalty.

1 CHAIRMAN CORRADINI: But their
2 operational plan was without the penalty there.
3 So now they've come back to explain how they'll
4 operate with the penalty?
5 MR. SAENZ: That's right, above 42
6 megawatts thermal per million pounds mass per hour.
7 CHAIRMAN CORRADINI: Okay.
8 MR. SAENZ: And there'll be some
9 discussion on that.
10 CHAIRMAN CORRADINI: Okay, fine. But
11 we have nothing about that, yes? The amendment?
12 Or the subcommittee information?
13 MR. KUNTZ: Yes, that was just
14 received.
15 MR. SAENZ: Right.
16 CHAIRMAN CORRADINI: Okay. And we'll
17 get it in time for our second subcommittee meeting?
18 MR. SAENZ: Of course.
19 CHAIRMAN CORRADINI: Good. Okay, and
20 then the second one. Explain that one for me?
21 MR. SAENZ: So this limitation was --
22 so the way it was written, it said -- the first
23 plant that goes into MELLLA+ will do Eigenvalue
24 tracking and track a series of parameters, and then
25 provide a report to the NRC.

1 That was written, really, with the
2 intention of a different plant than Monticello
3 being the first. So we talked about this before,
4 with how GE dispositioned this.
5 And they proposed an alternative
6 tracking several other plants that had higher power
7 to flow, because those would be more illustrative
8 of the performance of the methods.
9 So what Monticello has proposed is that
10 this report really would not be valuable for
11 Monticello --
12 CHAIRMAN CORRADINI: So they want to be
13 excused?
14 MR. SAENZ: That's right. So it's not
15 appropriate, because there's operation from other
16 plants that already cover their power to flow.
17 CHAIRMAN CORRADINI: And that also was
18 submitted recently?
19 MR. SAENZ: That was submitted on
20 Wednesday, that's right.
21 CHAIRMAN CORRADINI: Okay. Joy?
22 MEMBER REMPE: Since we disrupted your
23 flow conversation -- I guess I would like to have a
24 background, or a philosophy, type of question
25 that's not just pertaining to Monticello.

1 When we did the GE methodology, we
2 concluded that Monticello was lower power density -
3 - a lot of attributes that made it less challenging
4 in its operation.
5 And when we've had prior meetings on
6 EFW, they've come in and we've discussed what would
7 be required to get into the MELLLA+ or extended
8 flow window region.
9 And now we're going through and we've
10 said, well this is what's required for Monticello.
11 But what's generally required for other plants has
12 not really been described with this interaction.
13 And, so, maybe we might want to have
14 uncertainties, more sensitivities. So the answer
15 to this particular example may not be the generic
16 answer to what's required for extended flow window.
17 At least, that's my concern. And I
18 just wanted to hear what the staff thought about
19 that. Because I think we ought to be aware of
20 that, as we go through this interaction.
21 MR. SAENZ: Yes, so this is very much a
22 plant-specific --
23 MEMBER REMPE: And fuel-specific.
24 MR. SAENZ: That's right. So this
25 specific to Monticello, with ATRIUM 10X mixed in.

1 That was the scope of the staff's review. To talk
2 about really what we're going to need to do to
3 license other plants in EFW, I think was outside of
4 the scope of what we were planning on discussing
5 today.
6 MEMBER REMPE: Absolutely. But I just
7 would like to have that on the record and to keep
8 that in our thoughts because whatever happens here
9 may not be the answer for other plants that are
10 larger power, higher power density, other fuel
11 types, et cetera.
12 And I want to make sure that that's
13 expressed out front.
14 MR. SAENZ: Absolutely, and the staff
15 understands that. And, again, we just reviewed
16 what was presented to us now.
17 MEMBER REMPE: Absolutely, that's all
18 you can do.
19 MR. SAENZ: Yes, but I understand your
20 comment.
21 MEMBER REMPE: Okay.
22 CHAIRMAN CORRADINI: Kumar? Light's
23 on?
24 MR. UPENDRA: Yes, this is Kumar
25 Rohatgi. Just a simple, this 0.03 penalty. Is

1 this generic or plant-specific? And in your
2 further discussion, you justify 0.03. Why isn't it
3 0.04 or 0.05?
4 MR. SAENZ: It was to remain consistent
5 with what Monticello currently has with MELLLA+.
6 CHAIRMAN CORRADINI: This is what
7 they're already are operating under with MELLLA+.
8 MR. UPENDRA: But this is fuel-
9 specific, 0.03, no?
10 MR. SAENZ: No, it was not fuel-
11 specific.
12 MR. UPENDRA: Okay.
13 CHAIRMAN CORRADINI: Just to make sure
14 we say it correctly. It wasn't presented
15 initially? It was just for lack of experience,
16 generally, in the EPU range with an operating
17 window that is similar to both AREVA and GE?
18 MR. SAENZ: Yes. If you want a little
19 bit more background, really, if you looked at the
20 data at 42 megawatts thermal per million pounds of
21 mass per hour, there was just a drop off of data.
22 So it was just a lack of data from that
23 point on. So, really, that's where it came from.
24 CHAIRMAN CORRADINI: Okay.
25 MR. KUNTZ: This is just a brief

1 overview of the format of the safety violation
2 report. There's been, as background, seven
3 supplements to the original LAR, including this
4 most recent one.
5 There has been about 60 requests for
6 additional information from the staff, and this is
7 kind of how we laid out the SE. And then, just the
8 agenda moving forward, after Eric and I are done,
9 we'll turn it over to Xcel and they'll have some
10 presentations in the open portion.
11 And then the session will be closed
12 and, after Xcel's done, the staff plans to present
13 the results of their review.
14 CHAIRMAN CORRADINI: Okay, Eric?
15 MR. OESTERLE: Thanks Rob. Good
16 morning, Mr. Chairman and Subcommittee members. My
17 name is Eric Oesterle. I'm the new Chief of the
18 Reactor Systems branch in the Division of Safety
19 Systems in the Office of Nuclear Reactor
20 Regulation.
21 This is the first application to
22 operate in the extended flow window, or EFW, with
23 AREVA methods. EFW is parametrically the same as
24 MELLLA+, and Monticello has been previously
25 approved to operate in the MELLLA+ power flow

1 domain.

2 So, Mr. Chairman, I think you saw --

3 you must have had a look at my opening remarks.

4 So, what I'm going to say is probably going to

5 sounds repetitive, but so be it.

6 Since Monticello had transitioned to

7 AREVA fuel, the review focus of my staff was on

8 reactor systems. And this was a plant-specific

9 review, as my staff has already indicated.

10 There were three main parts of the

11 review for Monticello to operate an EFW. First,

12 the review of AREVA design basis methods. Second,

13 the review of AISHA and SINANO codes as acceptable

14 codes for use in anticipated transient without

15 scram with instability, that's ATWS-I. That's a

16 beyond design basis analysis.

17 And, third, the application of those

18 methods and the acceptability of the plant-specific

19 portions of the enhanced option three stability

20 solution.

21 The staff has been working long and

22 hard on this review. They had a very productive

23 audit at the AREVA facilities in Richland,

24 Washington last year, June 15, 2015.

25 The staff did a very thorough review of

1 the area described previously, the three items, and
2 was assisted by our contractor from Oak Ridge
3 National Laboratories.
4 And we want to thank the Oak Ridge
5 staff, especially our consultant who is a current
6 member of ACRS, Dr. March-Leuba.
7 CHAIRMAN CORRADINI: He's been sent
8 away.
9 (Laughter)
10 MR. OESTERLE: He did an outstanding
11 job for the staff, over the last 30 years,
12 especially in the review of BWR thermal-hydraulic
13 stability. And so, with that, I'd like to turn it
14 over to the licensee for their presentation today.
15 CHAIRMAN CORRADINI: Okay, good, thank
16 you. Thank you, Eric. Thank you, Rob. Okay, so
17 we'll have a switch of the key personnel in front
18 of the room.
19 Staff goes left. Licensee and their
20 experts come right. This is like a passion play,
21 stage left, stage right. Pete, you'll kick us off?
22 Okay, so Mr. Gardner, go ahead.
23 And just to remind everybody, this is
24 still open session. After we're don with this
25 presentation, we will stop and take public comments

1 and then go into the closed session the rest of the
2 day.
3 MR. GARDNER: All right, good morning
4 everyone. My name is Pete Gardner.
5 CHAIRMAN CORRADINI: Oh yes, green
6 light on. At the very bottom, it says push.
7 MR. GARDNER: Now it's really on. All
8 right, good morning. My name is Pete Gardner. I'm
9 a Site Vice President at Monticello. On behalf of
10 Xcel Energy, I want to thank Mr. Kuntz, the NRC
11 staff and the ACRS for organizing this review of
12 the AREVA extended flow window for Monticello
13 Nuclear Generating Plant.
14 This is the final license amendment
15 request for the window that supports our transition
16 from GNF fuel GE14 to the AREVA ATRIUM 10X that
17 we've already talked about.
18 That starts in 2017. We were here in
19 July of 2015 to provide you an informational
20 briefing. We are back today with a final
21 amendment. We are here today because of the
22 analysis of potential core instability in this
23 region for your purview.
24 We have a team of experts with us today
25 to walk through the highlights of our analysis and

1 answer any preliminary questions. This team
2 includes a licensed senior reactor operator, Rick
3 Stadlander to my right, a reactor engineer, Tamara
4 Malaney to my left and we have some other folks
5 with us as well.
6 And, certainly, we have AREVA with us
7 as well. We are not extending the GE MELLLA+
8 technology to include the AREVA fuel design, I just
9 want to be clear on that.
10 As we'll describe in more detail later,
11 we are not using stability methods for GE for trak.
12 We are using AREVA suite of analysis that fulfill
13 the licensing requirements established for MELLLA+.
14 And proven that those AREVA applicable
15 in the extended operating domain that we'll discuss
16 today. Monticello needs this amendment because the
17 GE MELLLA+ methodology, which you have previously
18 reviewed, does not support the AREVA fuel.
19 The use of an extended operating
20 domain, such as EFW or MELLLA+, is essential to
21 safe operation of the full extended power operation
22 because it limits the number of control rod
23 manipulations that will be required.
24 The AREVA methodology is well-supported
25 by physical testing and industry benchmarks. Note

1 also today that Xcel Energy has created limited
2 three party agreements that allow some sharing of
3 proprietary information between GE and AREVA when
4 it's associated specifically with Monticello.
5 So, if AREVA gives you a comparison
6 between their method', results and GE method's
7 results, they are well-informed. Before we get to
8 the AREVA presentation, of their analytical
9 methods, we have a presentation of some project
10 background that may be helpful.
11 Simply put, the purpose of the extended
12 flow window LAR is to allow continued Monticello
13 operation in the MELLLA+ extended operating domain
14 when we transition to the AREVA ATRIUM fuel in
15 2017.
16 Secondly, we hope to describe enough of
17 the license amendment request and supporting
18 analysis to assure you that it is complete. In
19 fact, it was accepted by the NRC staff in January
20 of 2015 and six supplements issued since then that
21 we just talked about.
22 Thirdly, to the extent that GE MELLLA+
23 provided the licensing precedent for extended
24 operating domains, we will compare the AREVA
25 analysis to the analysis provided for MELLLA+.

1 And, lastly, we will briefly discuss
2 the changes since our informational briefing last
3 year. Some changes resulted from NRC staff
4 questions. Some change resulted from corrections
5 to the analysis.
6 No changes were significant enough to
7 change the conclusion that the Monticello core will
8 be safely operated and stable in the new extended
9 flow window.
10 To take you through the next couple of
11 slides, Tamara Malaney, our plant reactor engineer
12 involved in this project, will take you through
13 that.
14 MS. MALANEY: The purpose of this slide
15 is to illustrate that EFW represents the same
16 parametric envelope in the power flow map as
17 MELLLA+. We found that we had to change what we
18 called it, just to keep it straight and for
19 commercial reasons.
20 So extended operating domain is what we
21 refer to either MELLLA+ or EFW. And MELLLA+ is the
22 GE terminology, and extended flow window is the
23 AREVA terminology.
24 And those extended flow domains are all
25 defined in the COLR, where we put the power flow

1 map, the Core Operating Limits Report. Next slide.
2 Due to the complexity and scope of certain portions
3 of the fuel transition, mainly the EFW portion
4 mostly, we decided to split the licensing into
5 three separate amendments.
6 First we had the fuel storage changes
7 amendment, and this one was fairly straightforward.
8 We submitted it early to give the NRC staff the two
9 year review time that is customary for spent fuel
10 criticality amendments.
11 And it was approved in 2014. So now we
12 can put AREVA fuel into our spent fuel pool. Next,
13 we have the fuel transition amendment, which was
14 approved last year.
15 My notes are not updated. This
16 amendment allows us to load AREVA fuel in the core,
17 but does not let us operate past the MELLLA line.
18 Finally, we have the EFW amendment request, which
19 was submitted in 2014 and was accepted for review
20 by the NRC staff in January 2015.
21 This amendment will ensure continued
22 full power EPU capability with AREVA fuel. The two
23 key parts of this amendment are the use of AREVA's
24 enhanced option three, for what I call regular
25 stability.

1 And then, using AISHA and SINANO for
2 the ATWS with Instability Analysis.
3 MEMBER REMPE: Excuse me?
4 MS. MALANEY: Yes.
5 MEMBER REMPE: Do you ever have channel
6 boxes containing assemblies of GE fuel next to
7 channel boxes with AREVA fuel, so the control
8 blades are in contact with different vendor fuel?
9 MS. MALANEY: Yes.
10 MEMBER REMPE: Okay, thank you.
11 MS. MALANEY: Okay.
12 MEMBER REMPE: Oh, also, are you ever
13 planning to go to ATRIUM 11? Because sometimes
14 we've asked other folks and they'll say, oh yes,
15 we're planning to do this, it's coming up soon.
16 MS. MALANEY: No plans in the near
17 future.
18 MEMBER REMPE: Okay, thank you.
19 MS. MALANEY: I can't answer for what
20 we're going to do 10 years from now.
21 CHAIRMAN CORRADINI: Or a year from
22 now.
23 MS. MALANEY: Pardon?
24 CHAIRMAN CORRADINI: Or a year from
25 now.

1 MS. MALANEY: I don't want to make any
2 more fuel changes, they're a lot of work.
3 (Laughter)
4 CHAIRMAN CORRADINI: I had a feeling
5 that's where you were coming from.
6 MS. MALANEY: So, as the NRC staff said
7 earlier, this is a site-specific license request.
8 We're not trying to make it so that everyone in the
9 industry can get EFW.
10 We know we're breaking ground for
11 everyone. But we also know that we're a much
12 smaller, more stable plant than everyone else. So
13 they can't just take our precedent.
14 EFW is a region on the power flow map.
15 You can see it in red on the graphic. I'm sure
16 you've seen it on lots of other pictures as well.
17 And it doesn't include other areas of the map.
18 We are already licensed to operate in
19 MELLLA with the AREVA fuel. The new EFW domain is
20 implemented in the Core Operating Limits Report.
21 And we use the methods listed in the Core Operating
22 Limits Report section of our tech specs.
23 The main point of similarity between
24 MELLLA+ and EFW is they're the same power flow
25 domain. Finally, enhanced option three replaces

1 the detect and suppress solution confirmation
2 density algorithm with a simpler approach.
3 CHAIRMAN CORRADINI: And we're going to
4 come back to this, but the simpler approach is
5 already approved for past operation, if I remember
6 correctly?
7 MS. MALANEY: Yes. EO3, that's how you
8 usually write it out. But usually when saying it
9 out loud, you say enhanced option three.
10 CHAIRMAN CORRADINI: Okay. But
11 enhanced option three is used under MELLLA?
12 MS. MALANEY: Yes.
13 CHAIRMAN CORRADINI: Okay, that's what
14 I thought.
15 MS. MALANEY: It was specifically
16 approved for extended operating domains. At that
17 point, Xcel Energy hadn't insisted on calling it
18 EFW to make it clear in everyone's minds.
19 So that topical discusses MELLLA+, but
20 it's the same operating domain. Are you ready?
21 CHAIRMAN CORRADINI: Go ahead.
22 MS. MALANEY: Okay.
23 CHAIRMAN CORRADINI: Don't wait for us.
24 MS. MALANEY: So it replaces it with
25 the regular period-based detection algorithm as the

1 primary method of stability protection. And then,
2 we repurpose the simulated thermopower scram to
3 provide protection against single channel
4 instabilities, and also provide the backup, just
5 like it does for DSS-CD.
6 This is the only physical modification
7 associated with the implementation of EFW. And
8 this greatly simplifies the tech spec progression
9 in the event of inoperable oscillation power range
10 monitors, which has been one of the sticking points
11 with operations.
12 Because the tech specs go, if this,
13 then this and then if that, then this - it gets
14 kind of complicated for everyone.
15 MR. UPENDRA: A quick clarification.
16 Now when you're moving away from DSS, you're not
17 detecting instability, you have a power flow
18 forbidden region which you get from some
19 calculation.
20 And when you get there, you scram the
21 reactor. That's the philosophy.
22 MS. MALANEY: Yes, we still have the
23 oscillation power range monitors, and they're using
24 the period based detection that was used with
25 original option three.

1 And then we have the backup, the growth
2 based algorithm and the amplitude based algorithm.
3 It's just we're putting a jumper over the DSS-CD
4 algorithm.
5 And then we will have the backup
6 stability regions on the map. So if you go into
7 region one, that's a scram the plan. If you go
8 into region two, try not to do it during normal
9 operation because it's not prudent.
10 And then, if your OPMs are inoperable,
11 then you get out of the region. Is that okay?
12 CHAIRMAN CORRADINI: Can you say that
13 again, slower?
14 MS. MALANEY: I'm sorry.
15 CHAIRMAN CORRADINI: No, no, it was
16 good. Just a little louder and a little slower.
17 MS. MALANEY: I'll move slightly closer
18 to the mic.
19 CHAIRMAN CORRADINI: Okay.
20 MS. MALANEY: Okay, so with DSS-CD, you
21 have the detect and suppress solution confirmation
22 density algorithm. And then you have the three
23 backup algorithms.
24 You have the period based, the growth
25 based and the amplitude based. And you don't have

1 stability regions at all. They're not required by
2 the topical.
3 They're not required by the method.
4 But if your OPMs go inoperable, then you put the
5 stability regions on the map. And then there's
6 this progression of, you turn on your backup scram,
7 right?
8 The repurposed simulated power scram,
9 so it protects region one. Everyone's familiar
10 with region one, right?
11 CHAIRMAN CORRADINI: That's with DSS,
12 you just went through.
13 MS. MALANEY: Right.
14 CHAIRMAN CORRADINI: Okay.
15 MS. MALANEY: So, with enhanced option
16 three, we turn off the DSS-CD scram entirely.
17 Since it's no longer licensing phase, we don't have
18 a fancy setpoint analysis for it.
19 And our primary method is the period-
20 based detection.
21 CHAIRMAN CORRADINI: Okay.
22 MS. MALANEY: And we have the two
23 backup algorithms still, as well. And then we have
24 the stability regions on the map. And we use those
25 during our MELLLA operation.

1 And depending on whether or not your
2 OPMs are inoperable, you have different actions to
3 take. So, if your OPMs are inoperable, you go into
4 region one, you definitely scram right away.
5 If you go into region two, you get out
6 of it right away. And if your OPMs are operable,
7 so you have automatic stability protection, then if
8 you go into region one, you have to get out of it
9 right away.
10 And if you go into region two, you
11 don't really do it, you get out of it in a more
12 controlled fashion. Or you perform additional
13 monitoring. And that's just regular option three.
14 And then for enhanced option three, is
15 we have a simulated thermo power scram that
16 protects you against going into single channel
17 instabilities. And that's required to be operable
18 whenever we're above 70 percent power.
19 And it also functions as a backup
20 scram, backup to your OPM scram if your OPMs are
21 inoperable. So we set up the setpoint so it
22 protects both the single channel instability
23 exclusion region, where you can get a single
24 channel instability. And so it would protect all
25 of region one.

1 CHAIRMAN CORRADINI: But I summarize
2 this in dispatch and you correct me. You now are
3 falling back to an accepted procedure for detecting
4 any potential instability. So we're going back to
5 a MELLLA-like logic?
6 MS. MALANEY: Yes.
7 CHAIRMAN CORRADINI: Okay.
8 MS. MALANEY: But with the extra scram
9 that's on whenever you are -- the intersection of
10 the MELLLA+ EFW region and the MELLLA line is just
11 above 70 percent power.
12 CHAIRMAN CORRADINI: So, on your map,
13 previously slide, that's Point M? I'm trying to --
14 I'm going to have to expand your map.
15 MS. MALANEY: My slides are too small.
16 CHAIRMAN CORRADINI: It's a teeny tiny
17 map.
18 MS. MALANEY: Yes. So --
19 CHAIRMAN CORRADINI: You can't do that.
20 MR. UPENDRA: It moved back to the
21 previous slide, number C.
22 MS. MALANEY: Yes.
23 CHAIRMAN CORRADINI: It's the knuckle
24 at the low flow, low power?
25 MS. MALANEY: Yes, that's just above 70

1 percent.

2 CHAIRMAN CORRADINI: Okay.

3 MS. MALANEY: That's like 70.4.

4 CHAIRMAN CORRADINI: Thank you.

5 MR. UPENDRA: Okay, just, so what's

6 your hierarchy? Detection is the first level of --

7 If detection doesn't work, then you move on to the

8 forbidden instability region based on your

9 calculations. So what is your hierarchy of all of

10 these options?

11 CHAIRMAN CORRADINI: I'm going to try

12 this. This is like an oral exam. I think she

13 said, first period, then growth, and then excluded

14 regions, is what I thought she said.

15 MS. MALANEY: For the OPM regions, yes.

16 CHAIRMAN CORRADINI: Yes.

17 MR. UPENDRA: Okay, so the excluded

18 region is lower hierarchy, which is what it should

19 be, yes.

20 MS. MALANEY: So we start out relying

21 on the oscillation power range monitors. And, sort

22 of at the same time, we're hitting the simulated

23 thermo power scram, because of where it's at.

24 So you'll cross over and you'll scram

25 from that, honestly, first before you would scram

1 from the OPMs a lot of the time. And then, if all
2 that fails, we still have operator actions.
3 MR. UPENDRA: Thank you.
4 CHAIRMAN CORRADINI: Okay. Are you all
5 right?
6 MR. UPENDRA: Yes. I have one question
7 later on, but that's okay for now.
8 CHAIRMAN CORRADINI: Okay, go ahead.
9 MEMBER SUNSERI: So, let me just a
10 question. I'm a PWR guy, so this is like very
11 confusing to me. Can I hear from Rick, from an
12 operator's perspective. I mean, how complicated is
13 this in practice? I mean, I understand the theory.
14 MR. STADTLANDER: This is Rick
15 Stadtlander from Xcel Energy. It's actually not
16 all that complicated. We actually had this in
17 place, previously, without the DSS-CD.
18 So we, within Monticello, have operated
19 under these expectations, this training, this
20 guidance, previously. So going back to it won't be
21 that big of a deal.
22 We'll refresh on the training. It's
23 actually been in progress. You know, it's been in
24 the process previously. So it will be just a
25 matter of retraining and making sure we're up to

speed and then moving forward.

So it's nothing that we've lost previously, you know, it's still been in place as well.

MEMBER SUNSERI: Thank you.

CHAIRMAN CORRADINI: Go ahead.

MS. MALANEY: Next slide? I wanted to talk a little bit about the plant changes required to implement EFW. So, first we're going install the DSS-CD jumpers.

And that jumper's out of the scram, so it can actually come in. We're going to enable the extended flow window stability trick. We renamed it, relative to what was in the enhanced option three topical for human factors.

Because the operators were getting confused because we had ABSP, BSP, BSP regions, SPT is what it was called in the topical --

CHAIRMAN CORRADINI: I'm already confused. (Laughter)

MS. MALANEY: Right.

CHAIRMAN CORRADINI: So, I know you said this twice already, but for enabling the newly-labeled EFWS trip, again?

MS. MALANEY: Yes.

1 CHAIRMAN CORRADINI: It is?

2 MS. MALANEY: Extended Flow Window

3 Stability Trip. Yes.

4 CHAIRMAN CORRADINI: And that's based

5 off of excluded regions or, again --

6 MS. MALANEY: It covers two things.

7 So, excluded regions is a good generic term.

8 CHAIRMAN CORRADINI: Okay, fine, thank

9 you.

10 MS. MALANEY: And that's just pressing

11 some buttons on the APRM software. It's not a

12 physical change, but it's a thing we have to do

13 during start up and shut down.

14 MR. SAENZ: This is Diego. Just for

15 clarity, I think you were calling it SDP before,

16 because that's what it used to be called --

17 MS. MALANEY: Well, in the topical, it

18 was called SPT, Stability Protection Trip, but the

19 actual trip function that's being used is simulated

20 thermal power, which was very confusing and just

21 setpoint we used SEPARATE.

22 MR. SAENZ: Yes, but just for

23 everybody's benefit, I think, in a previous

24 discussion she was talking about this trip, but she

25 was calling it the other name.

1 MS. MALANEY: Last summer, yes, we
2 hadn't refined our terminology as much as she could
3 have. We
4 are gpomg temperature update our power flow map
5 displays.
6 We have those on several computers.
7 And we're going to revise our procedures, our tech
8 specs and we're going to accept all of the new
9 analysis into our plant document control system.
10 Next slide? Operation changes.
11 There's minor impact in maneuvering, just because
12 we have the stability regions back on the map. And
13 they're a little bit differently sized than they
14 are for DSS-CD.
15 We have the new stability solution,
16 which obviously is important, but doesn't matter a
17 whole lot during normal operation because we don't
18 normally have instabilities.
19 And, finally, there's a higher
20 probability of a plant scram following a re-
21 circulation pump trip or run back. And that's just
22 because the way we had to set up the extended flow
23 window stability scram to cover both the channel
24 instability exclusion region and region one.
25 It just means that if we reduce recirc

flow dramatically, we're more likely to hit the scram. Okay? We've been operating in the MELLLA+ region since June 2014.

Operation within the extended operating domain is just normal business for us. It's not really any different on a day to day basis. We completed our MELLLA+ testing in June 2015.

There was one event during the testing that wasn't a big deal, but is the most interesting thing we were able to come up with about operating in MELLLA+. It really is that boring.

(Laughter)

MEMBER REMPE: Tell us about it.

(Laughter)

MS. MALANEY: Please forgive me, I have to read because it's all about chemistry and I'm a reactor engineer. Chemistry is fine, but he didn't teach me much chemistry. It's his fault.

(Laughter)

CHAIRMAN CORRADINI: It's my fault, go ahead.

MS. MALANEY: So we had a spike in the main steam line rad monitor readings during the reactor level dynamics testing. The spike was due to an increase in steady state hydrogen

concentration entering the core, followed by a level perturbation.

You do the level perturbation because that's part of the dynamics testing to make sure you know how the system will respond when you do a level perturbation.

So hydrogen is injected into our feed water to mitigate stress corrosion cracking in the vessel. At the MELLLA+ test conditions, which are within five percent of the MELLLA+ line, the ratio of core flow to feed flow is lower than during normal operation.

So the hydrogen concentration is higher in the core, because you have more feed water coming in. It's a greater proportion of what's inside the core. The increased hydrogen leads to a more reducing chemistry environment in the core, feeding into a chemical equilibrium shift to ammonia, which is soluble in steam and carries out nitrogen 16 out through the main steam lines.

CHAIRMAN CORRADINI: That is complicated.

MS. MALANEY: This is not an issue during normal plant operation, because we're not normally operating way down there. And, as part of

1 the overall closeout of EPU and MELLLA+, we are
2 performing a hydrogen benchmark shortly.
3 It was supposed to be this week, but
4 our down power didn't go fantastic.
5 CHAIRMAN CORRADINI: So let me -- I'm
6 still struggling about where all this is on the
7 map. So you're now around Point M when you were
8 doing this testing? Down at the knuckle again?
9 MS. MALANEY: No. So, when we were
10 doing the testing, we had to do it at various power
11 flow state points.
12 CHAIRMAN CORRADINI: Up the curve?
13 MS. MALANEY: Yes.
14 CHAIRMAN CORRADINI: Or up the line?
15 MS. MALANEY: Yes. So it wasn't at the
16 very lowest --
17 CHAIRMAN CORRADINI: But this occurred
18 at the lower part of the line, or the upper part?
19 MR. STADTLANDER: This was in -- yes,
20 just above N, and I can't read the letter that's up
21 above that.
22 CHAIRMAN CORRADINI: M. What I call
23 the knuckle, the strange stare step there.
24 MR. STADTLANDER: Okay.
25 CHAIRMAN CORRADINI: Yes, okay.

1 MR. STADTLANDER: Yes, it would have
2 been up in the higher power -- right in that low
3 flow area, but right in the higher section of that.
4 CHAIRMAN CORRADINI: Got it.
5 MS. MALANEY: Right.
6 CHAIRMAN CORRADINI: Okay, thank you.
7 MR. STADTLANDER: Yes.
8 MEMBER SUNSERI: Did that spike
9 challenge any automatics at that point, or
10 anything?
11 MS. MALANEY: No.
12 MEMBER SUNSERI: No margin redux --
13 MS. MALANEY: It's an EWP entry
14 setpoint, so once we -- I mean, it was just a
15 spike. It went up, and then it came down. And
16 then, once we understood what was going on, we were
17 able to exit our emergency operating procedures.
18 Okay?
19 We have had no stability events at
20 Monticello, but we had a DSS-CD alarm when we went
21 into single-loop operation last fall. So, as a
22 result of that experience, we raised our alarm
23 setpoints, which are licensee controlled from 1.05
24 to 1.07, and the number of cells required for an
25 alarm from 1 to 2.

1 So we looked at the data, we consulted
2 with GE and determined it would be a good idea to
3 move the setpoint up just slightly. Questions?
4 Comments? So, one item that has come up with the
5 NRC staff, the Monticello staff is making sure that
6 we have a full suite of analysis for EFW.
7 We have a whole set up slides here that
8 show that we do have a full set. And this is more
9 from an overall perspective. We don't go into the
10 nitty gritty of every ANP that we submitted.
11 So I want to start out with going over
12 what we had for MELLLA+. We have a global plant
13 evaluation for generic BWRs in the extended
14 operating domain.
15 That's in the top middle there. That's
16 the MELLLA+ topical that says, overall what you
17 have to do and what matters. And it's supported by
18 a site-specific safety analysis report.
19 And, together, these documents address
20 the operability of systems, structures and
21 components in the extended operating domain, with
22 the exception of ATWS with Instability.
23 That's because the GE methods for that
24 are in separate topicals. ATWS-I was a matter of
25 much NRC staff and ACRS review. It used TRACGs,

1 the primary method to model drought and re-wet
2 phenomenon.
3 But, in the end, we used it to provide
4 an engineering solution. We make sure that
5 operations initiates action to reduce water level
6 prior to the onset of instabilities.
7 So we stop the instability before it
8 can even happen. Supporting the generic MELLLA+
9 topical are three sub tier topicals, the NEDC-33173
10 - I call it the IMLTR, Inter Methods Licensing
11 Topical Report.
12 And then the two long-term core
13 stability solutions - The DSS-CD topical and the
14 TRACG topical related to DSS-CD.
15 CHAIRMAN CORRADINI: So, on the next
16 one, now go back where there's pink and blue.
17 MS. MALANEY: Yes.
18 CHAIRMAN CORRADINI: So I'm struggling
19 here. Now I've got a mixed core. Am I now asking,
20 under MELLLA operation, am I using GE methods for
21 both the mixed core?
22 And then, if approved to go the EOD,
23 I'll use your terminology, to your Extended
24 Operating Domain, you're going to switch over to
25 the pink methods for both fuel types? I didn't

1 understand the three slides.

2 MS. MALANEY: What fuel do you think we

3 have in the core right now?

4 CHAIRMAN CORRADINI: I think you have

5 only GE fuel.

6 MS. MALANEY: Okay, sorry.

7 CHAIRMAN CORRADINI: Did I score

8 correctly?

9 MS. MALANEY: Yes.

10 CHAIRMAN CORRADINI: But when you go in

11 and put in the mixed core in calendar year 2017,

12 are you going to use, then, the -- what I'm trying

13 to understand is, what methods -- are we switching

14 over to the method you show in pink?

15 MS. MALANEY: Yes.

16 CHAIRMAN CORRADINI: Okay.

17 MS. MALANEY: There are a handful of

18 things that are carryover.

19 CHAIRMAN CORRADINI: You've answered.

20 MS. MALANEY: Okay.

21 CHAIRMAN CORRADINI: I've got you now.

22 Thank you.

23 MS. MALANEY: And this is -- we have

24 both of the methods on here, just so you can see

25 where both of those go.

1 CHAIRMAN CORRADINI: Okay, so you're
2 not going to tread -- okay. I saw this, and I
3 thought, oh god.
4 MS. MALANEY: Illustrative purposes
5 only. But I guess it --
6 CHAIRMAN CORRADINI: Okay, but the
7 transition really is for one set of methods, shown
8 in blue, to when you get a mix for what is shown in
9 pink? Okay. And a little blue. Got it, thank
10 you.
11 MS. MALANEY: There are certain things
12 that GE's analyzing that we don't have to redo.
13 CHAIRMAN CORRADINI: Understood, thank
14 you.
15 MS. MALANEY: So, now we have the AREVA
16 stuff in pink. We have a site-specific evaluation
17 of system structures and components. And that
18 builds on the previous work from GE.
19 We don't need to do a re-analysis that,
20 for example, liquid rad waste does not need to be
21 re-analyzed for the change in fuel. We have new
22 site-specific ATWS-I methods that are rigorously
23 developed and leverage extensive KATHY Loop test
24 data.
25 And then we have ANP 3135, which

1 determines, specifically, that AREVA methods are
2 applicable in the extended operating domain for
3 Monticello.
4 During the development of this
5 document, AREVA with some help of Xcel reviewed the
6 limitations and conditions and ranges of
7 applicability of all of the licensing topical
8 reports used in the extended flow window analysis,
9 to ensure that all of the methods are still valid
10 in the extended operating domain.
11 We have a long-term stability solution
12 that uses an AREVA-approved licensing topical
13 report for enhanced option three, which was
14 reviewed by the ACRS several years ago, and was
15 NRC-approved.
16 And then we have a site-specific
17 development of our extended flow window stability
18 trip to document all of our processes for that. So
19 this slide illustrates the final state of
20 progression from the MELLLA+ suite of analysis, the
21 AREVA suite.
22 The significant pieces remaining from
23 MELLLA+ are some portions of the MELLLA+ licensing
24 and topical report and the site-specific MELLLA+
25 safety analysis report.

1 Otherwise operation of the EFW domain
2 with AREVA fuel and representative mix cores, which
3 is what we analyzed for the submittal is covered by
4 a whole new suite of AREVA analysis.
5 This transition is supported by the
6 proposed tech spec changes, which remove the
7 MELLLA+ methods and install AREVA methods. All
8 AREVA methods used for the MELLLA+ EFW meet the
9 method-specific grounds of applicability and any
10 applicable limitations and conditions.
11 CHAIRMAN CORRADINI: Go ahead.
12 MR. UPENDRA: This is a quick question.
13 When the GE methods were approved, it went through
14 an extensive process where they had the part
15 process with 28 high-ranking phenomena for which
16 the applicability and all that was done.
17 Is the same process being done for the
18 AREVA method when you submit for approval?
19 MS. MALANEY: I'm looking to Dan
20 Tinkler behind you.
21 MR. TINKLER: This is Dan Tinkler from
22 AREVA. If you look, down at the bottom left, we
23 have a report that's specific to applicability of
24 methods. And in there, we step through the
25 important phenomena, and how each of our methods

1 covers that within the EFW domain.

2 MR. UPENDRA: Okay, so you have

3 separate effectors, intramural effectors, and

4 somebody looked at all the correlations and all

5 that?

6 MR. TINKLER: Right.

7 MS. MALANEY: Thank you. The NRC staff

8 requested that we cover three key analysis points

9 during our presentation. I'll go into more detail

10 on these three points over my next few slides.

11 In ANP 3135, which was submitted as

12 part of the initial submittal, it's described the

13 applicability of each method. First, each method

14 was checked for SER restrictions on power, flow or

15 the parameters most impacted by the power level

16 change - the increased power level and decreased

17 flow, steam feed flow, and core average void

18 fraction.

19 The AREVA methods are characterized by

20 technically rigorous treatment of phenomena, and

21 are very well benchmarked. Key Monticello data was

22 plotted against the method qualification data to

23 show that Monticello is within the qualification of

24 the method.

25 For the Monticello EFW transition, both

1 -- so, that's generally speaking. I have the one
2 example that was easy to describe and can be
3 discussed in the proprietary section. Most other
4 things fall into the proprietary section.
5 For the Monticello EFW transition, both
6 SPCB and ACE are used as CPR correlations for GE
7 and AREVA fuel specifics, respectively. The
8 Monticello SPCB is based on the indirect
9 correlation method in the topical, for which GE
10 assembly critical power data is produced by GEXL.
11 And the SPCB correlation is fitted to
12 the GEXL data. The ACE correlation is based on
13 full scale bundle testing. And, for both methods,
14 there are no SER restrictions that are for power or
15 flow.
16 And Monticello EFW operation falls
17 within the bounds of applicability.
18 CHAIRMAN CORRADINI: Can I stop you
19 there, since --
20 MS. MALANEY: Sure.
21 CHAIRMAN CORRADINI: So let me make
22 sure I get this right. I guess the SPCB is Siemens
23 Power Corporation B?
24 MS. MALANEY: Yes.
25 CHAIRMAN CORRADINI: Okay. So what I'm

1 trying to understand is to what you did. So, you
2 mimicked and then fitted an AREVA correlation to a
3 generated phantom set of critical heat fluxes from
4 the GEXL correlation? Am I understanding this
5 correctly?
6 MS. MALANEY: Yes.
7 CHAIRMAN CORRADINI: So you derived a
8 correlation for the GE fuel in the mixed core by
9 back calculating?
10 MS. MALANEY: That seems like an
11 accurate way to derive it.
12 CHAIRMAN CORRADINI: I just want to
13 make sure that I get it.
14 MS. MALANEY: Yes.
15 CHAIRMAN CORRADINI: Okay.
16 MS. MALANEY: The SPCB topical for --
17 Dan would like to talk.
18 CHAIRMAN CORRADINI: Dan?
19 MR. TINKLER: This is Dan Tinkler from
20 AREVA. The process that we used is described in
21 EMF-2245. That's an approved topical report for
22 use of AREVA correlations with (coughing) fuels.
23 For the process, there are two
24 approaches. There's a direct approach and an
25 indirect approach. The direct approach is if we

1 get actual CPR data.

2 CHAIRMAN CORRADINI: Sure.

3 MR. TINKLER: Then we would use it as

4 is. The indirect approach is what we used at

5 Monticello, which is, if we don't have access to

6 the data, essentially we create a dry lab set of

7 data.

8 CHAIRMAN CORRADINI: So, but you create

9 a phantom set of data based off their correlation?

10 MR. TINKLER: Right. But the topical

11 report also lists the allowed changes that we can

12 make. In this case, we're only allowed to adjust

13 that at a constant. So we're not necessarily re-

14 correlating, we're using a thick set of

15 coefficients in a defined manner, according to a

16 topical report, to fit that data.

17 CHAIRMAN CORRADINI: I know what you

18 said. I'm not sure what that means. You get to

19 change constants, but not exponents? Or you get to

20 change constants and exponents, but not physical

21 parameters like flow, sub-cooling, et cetera?

22 MR. TINKLER: We're allowed to change

23 the constants only, additive constants only.

24 CHAIRMAN CORRADINI: Okay, thank you.

25 MR. UPENDRA: I mean, do you have some

criteria of --

CHAIRMAN CORRADINI: If you're asking them to show you something, we're going to have to wait.

MR. UPENDRA: There will be something?

CHAIRMAN CORRADINI: Well, if there isn't something, you can ask. But it will have to wait until closed session.

MR. UPENDRA: Okay.

CHAIRMAN CORRADINI: But I think that's a fair question eventually.

MR. UPENDRA: And this ACE PI, you said that you have the data with the full length too?

MS. MALANEY: Yes.

MR. UPENDRA: Okay.

CHAIRMAN CORRADINI: And that, they'll present.

MR. UPENDRA: Sure.

CHAIRMAN CORRADINI: It's in the SER.

MS. MALANEY: Yes. I don't think we were planning to go into great depth on the ACE correlation, because that's a previously-approved topical. We're not doing anything special there.

MR. PANICKER: This is Matthew Panicker from SMPB. We reviewed the field transition, and

1 the field transition, for the sake of --

2 CHAIRMAN CORRADINI: You'll have to

3 speak a little bit louder, please.

4 MR. PANICKER: The field transition

5 layer was reviewed. And we reviewed what the SPCB

6 correlation applicable to GE fuel, as well as the

7 ATRIUM 10X correlation, in case the limiting fuel

8 is GE for impure. What EMF-2245 and ANP-10298 have

9 approved by the staff.

10 CHAIRMAN CORRADINI: So if we have

11 questions, Kumar, they can wait until closed

12 session. Go ahead.

13 MS. MALANEY: Yes. This is the map

14 that might have been useful to have earlier.

15 CHAIRMAN CORRADINI: That is true.

16 MS. MALANEY: I really like this --

17 CHAIRMAN CORRADINI: It's big enough

18 that I can see the numbers and letters.

19 MS. MALANEY: I like this one because

20 it shows all of our analysis state points. It

21 shows all the analysis for both our transition,

22 which was already approved, and for the EFW

23 submittal, both of them.

24 Because, originally, we did all of the

25 analysis as one. And you can see that we've

analyzed at the corners of the map. And this is really all I have to say on this one.

CHAIRMAN CORRADINI: What was the intent of going twice around the knuckle at Point M? Was there an expectation of a different result as you were going down in power but at constant flow? That just struck me as interesting.

MS. MALANEY: I think that was a topical restriction.

MR. TINKLER: This is Dan Tinkler from AREVA. There is some topical restrictions that require you to do that corner. And then the --

CHAIRMAN CORRADINI: There's some what restrictions?

MR. TINKLER: There's some topical restrictions.

MS. MALANEY: One of the -- IMLTR, and all of their MELLLA+ topicals, had limitations and conditions. And, for all of those, we either met them or said that they're not applicable.

And one of them was that we analyzed a specific power flow point and -- the very corner there, what you call the knuckle.

CHAIRMAN CORRADINI: Okay.

MR. TINKLER: And the point right below

1 it just happens to line up at 80 percent power,
2 which is a little more consistent with how we
3 define limits.
4 MS. ABDULLAHI: Can I ask a question?
5 Are you referring to the 50 megawatt -- what's that
6 point that IMLTR has, aside from your own stability
7 setpoint exclusion region?
8 MS. MALANEY: No, there's one that
9 says, thou shall do a LOCA analysis at a specific
10 stay point. And it's 57.4 percent. And then some
11 power level that I don't have memorized, and
12 probably isn't on my cheat sheet here.
13 CHAIRMAN CORRADINI: You just chose
14 this as an arbitrary point, at that set of
15 conditions, to do a LOCA?
16 MS. MALANEY: One of the MELLLA+
17 topicals requires that you have some kind of funky
18 operative points for LOCA.
19 CHAIRMAN CORRADINI: Okay, I like that.
20 Go ahead. Good. Okay, so that was what you chose
21 to demonstrate? That's what I'm still struggling
22 as to why that point?
23 MS. MALANEY: Okay, so the one that's
24 just below the line. Dan explained and says, AREVA
25 just does some analysis, whether it's LOCA or

1 something else, at 80 percent power.

2 CHAIRMAN CORRADINI: Okay.

3 MS. MALANEY: So that's what the line,

4 the dot right below M is.

5 CHAIRMAN CORRADINI: Yes, I understand

6 that.

7 MS. MALANEY: M is because it's right

8 at the corner, and you wanted to do the limiting

9 spots.

10 CHAIRMAN CORRADINI: Okay.

11 MS. MALANEY: And then, that one where

12 it kind of looks like MELLLA+ boundary, that line

13 is pointing at the point. That's one of those

14 weird ones that the topical requires.

15 CHAIRMAN CORRADINI: Save this figure,

16 we'll come back to it.

17 MS. MALANEY: Since MELLLA+ is the most

18 relevant precedent for this license amendment, each

19 limitation and condition of the MELLLA+ related

20 topicals were reviewed for applicability and either

21 met or deemed not applicable.

22 There's a very long list, so I wasn't

23 going to go over all of them here.

24 CHAIRMAN CORRADINI: Yes. If we could

25 summarize this, because I was trying to understand

1 in the SER, and going back to your documents, both
2 Xcel's and AREVA's.
3 My summary would be, and you correct me
4 if I'm wrong, that there's no additional
5 limitation. But some limitations have been
6 removed, or you're requesting removal.
7 But I saw no new limitations in the
8 extended operating domain.
9 MS. MALANEY: That's correct.
10 CHAIRMAN CORRADINI: Okay.
11 MS. MALANEY: Do you want me to skip
12 the rest of this --
13 CHAIRMAN CORRADINI: No, I just wanted
14 to make sure the starting point was at least
15 bounded.
16 MS. MALANEY: So, the IMLTR requires
17 that extended operating domains are either limited
18 to 50 megawatts thermal per megapound per hour, or
19 provide additional information regarding
20 uncertainties.
21 This limitation is met because the
22 Monticello extended operating domain is less than
23 50 megawatts thermal per megapound per hour. An
24 example of one that we deem not applicable,
25 limitation and condition 9.14 requires that part

21, on the GSTRM-related to thermal conductivity degradation, must be applied until the NRC staff informs GE of its conclusions.

This is not applicable because thermo conductivity degradation is already addressed by AREVA methods. The limitation and condition that has been of the most interest, especially recently, has been 9.5.

This requires a safety limit at or of .03 when operating above 42 megawatts thermal per megapound per hour. We just submitted, last Wednesday, a new safety limit CPR technical specification safety limits to apply this adder only when greater than or equal to 42 megawatts thermal per megapound per hour in the EFW region.

CHAIRMAN CORRADINI: So, to say it differently, it's not that you're asking to remove the adder, but you're saying the adder will only be effective in the blue region?

MS. MALANEY: That's correct.

CHAIRMAN CORRADINI: Okay.

MS. MALANEY: When we were using --

CHAIRMAN CORRADINI: Does that change. I mean, is that an operational -- I'm not familiar enough with EWR operation. Is that an operational

1 -- does that require operational changes or what?
2 You've got to help me, I don't understand why just
3 the blue region or what that simplifies.
4 MS. MALANEY: It, honestly, -- we
5 designed our core -- obviously, we're in the core
6 design process right now. We've already done the
7 bundle design.
8 We've already done the core design.
9 We've already started the analysis. Everything
10 that we were submitting was saying that the adder
11 was not applicable to us.
12 CHAIRMAN CORRADINI: But then, let me
13 ask you it differently. So that if I enter the
14 blue region, the setpoint for trip would change?
15 MS. MALANEY: Okay.
16 CHAIRMAN CORRADINI: That's what I'm
17 trying to kind of -- so, I understand you're going
18 to install an adder in the blue region. And that
19 does what for operation? Maybe that's the way I
20 should ask the question.
21 MR. STADTLANDER: Yes, that should all
22 be -- that will all be done in the background. So,
23 really, from an operational standpoint, you know,
24 it won't impact our day to day operation.
25 You know, if we have an area that gets

us into that, you know, that'll happen in the background. So, that'll be all set for us, ready to go as well. From an operational day to day, it won't impact, you know, the day to day operations.

CHAIRMAN CORRADINI: How does that limit operation in the blue region? That's what I -- then, let me ask that question. How does that limit operation? You've got to have a different setpoint if I have the SLMCPR with the adder versus without the adder?

MS. MALANEY: Can I back up a little bit?

CHAIRMAN CORRADINI: Sure.

MS. MALANEY: Because it sounds like you're asking more BWR-related questions. So it might help if I backed up a little.

CHAIRMAN CORRADINI: Sure.

MS. MALANEY: So the way --

CHAIRMAN CORRADINI: I'll take any help at all.

MS. MALANEY: The way BWRs deal with CPR is we have safety limit CPR that protects you against transition boiling. And then you add your delta CPR for the event, right? And none of this is an automatic trip.

1 CHAIRMAN CORRADINI: So then, what is -
2 - okay.
3 MS. MALANEY: So you have your core
4 monitoring system that calculates what your core
5 state is and what your minimum CPR in the core is.
6 And then we have it automatically do the math for
7 us.
8 CHAIRMAN CORRADINI: So the
9 calculations are done behind the scenes, such that
10 you cannot run the power up beyond the equivalent
11 of the SLMCPR plus the delta CPR to get you to
12 operating condition?
13 MS. MALANEY: That's correct.
14 CHAIRMAN CORRADINI: Okay.
15 MS. MALANEY: And there's power --
16 CHAIRMAN CORRADINI: So you just change
17 -- the logic of the calculation changes in the
18 background. Have I gotten it approximately right?
19 MS. MALANEY: Pretty close.
20 MR. STADTLANDER: Yes, that's all
21 controlled by the computer, you know, so there's no
22 calculations by the operators needed at that point.
23 CHAIRMAN CORRADINI: Okay.
24 MR. STADTLANDER: It's all handled in
25 the background.

1 CHAIRMAN CORRADINI: Okay, great, thank
2 you.
3 MR. UPENDRA: Just quickly, I have a
4 question. So you have this EFW -- you have a
5 criteria built into your plan, computers to scram,
6 to get into some region of instability.
7 So the blue region will be part of
8 that. If your system ever gets into the blue
9 region, you will be scram?
10 MS. MALANEY: No, --
11 CHAIRMAN CORRADINI: They don't let you
12 -- let me try. This is like a test for us. I
13 think what is being said by the applicant is that,
14 when they enter the blue region, there'll only be a
15 pre-calculated set of conditions that you cannot
16 get above a larger SLMCPR with the adder. It won't
17 allow you.
18 MS. MALANEY: Well, it's controlled by
19 operations. Because there's no automatic actions
20 that are taken, based on CPR in a BWR.
21 CHAIRMAN CORRADINI: So? Then, to his
22 question, if I enter that region, I'm still --
23 MS. MALANEY: Okay.
24 CHAIRMAN CORRADINI: Sorry that we're
25 not connecting.

1 MR. STADTLANDER: All right, so this
2 comes down to, essentially, as we get into here,
3 we've got a little bit more penalty on our thermal
4 limits. It doesn't come down to the scram
5 setpoints.
6 It doesn't come down to that. It's a
7 penalty on a thermal limit, so we have to be more
8 cognizant of that. The computer in the background
9 will actually take that information, it'll
10 calculate out what our core thermal limits are,
11 based on having that adder if we're in that region.
12 So it doesn't come into this --
13 CHAIRMAN CORRADINI: Core at the
14 operation stem.
15 MR. STADTLANDER: That's correct, yes.
16 CHAIRMAN CORRADINI: Okay.
17 MR. UPENDRA: So there is no automatic
18 action? There's just information to the operators.
19 MR. STADTLANDER: That's correct, yes.
20 CHAIRMAN CORRADINI: Thank you.
21 MEMBER BALLINGER: Again, just to be
22 clear. While there's no automatic action, there is
23 a restriction. And the operators have to adhere to
24 that.
25 MR. STADTLANDER: That's correct, yes.

1 MS. MALANEY: Yes.

2 MR. STADTLANDER: We know we have that
3 adder. It's our normal thermal limits. We just
4 have an extra adder when we're in the blue-shaded
5 region.

6 MS. ABDULLAHI: Can I ask a question.
7 I thought the adder was for the MELLLA+ domain.
8 Nobody ever before had a line and said, I'll add
9 the number only in this area. Is that what you're
10 saying?

11 MS. MALANEY: I can -- do you want to
12 go, Diego? So, in the IMLTR, it was a restriction
13 of .03 everywhere in MELLLA+.

14 MS. ABDULLAHI: Right.

15 MS. MALANEY: In the most recent of the
16 IMLTR, they reduced the adder to .02, and it
17 applies when above 42 megawatts thermal per
18 megapounds per hour.

19 CHAIRMAN CORRADINI: They? Who's they?

20 MS. MALANEY: A combination of GE and
21 the staff, right?

22 CHAIRMAN CORRADINI: That's new to me,
23 but okay.

24 MS. MALANEY: It's the most recent
25 version of the IMLTR.

1 CHAIRMAN CORRADINI: Okay.

2 MS. MALANEY: And the adder below the
3 line is .01 for generic EPU sort of stuff. We have
4 provided sufficient data to justify it not having
5 an adder below this 42 megawatts thermal per
6 megapound per hour line.

7 And, for consistency with what we had
8 before, it's a .03 adder above the line.

9 MR. UPENDRA: You have a smaller adder
10 in the NML line? I mean, blue has .03.

11 MS. MALANEY: That's correct.

12 MR. UPENDRA: Just below that blue is
13 .01.

14 MS. MALANEY: We provided sufficient
15 gamma scan data and other related data to the
16 staff, such that adder is not required.

17 MR. UPENDRA: Below? Okay.

18 CHAIRMAN CORRADINI: But just so that
19 we're on the same page -- this has already been
20 approved by the staff with GE methods. In any
21 case, you're just essentially showing your method
22 of operation inside the shaded region?

23 MS. MALANEY: That's correct.

24 CHAIRMAN CORRADINI: Or submitting your
25 method of operations?

1 MS. MALANEY: Yes.
2 CHAIRMAN CORRADINI: Thank you.
3 MS. MALANEY: That's all I have for
4 this slide.
5 MR. GARDNER: Do we have any quorum
6 issues?
7 CHAIRMAN CORRADINI: Say it again,
8 please, I'm sorry.
9 MR. GARDNER: I was just asking if we
10 had any quorum issues. Or do you need us to wait?
11 CHAIRMAN CORRADINI: No, no. Okay, I
12 didn't know what you said. Yes, we can go down to
13 a minimal number, but we're okay.
14 MR. GARDNER: Thanks.
15 MS. MALANEY: Next, I have key results
16 comparison. As you can see, the vessel pressure
17 and the operating limits CPR are about the same for
18 AREVA and GE analysis.
19 We do not have the Cycle 29 analysis
20 complete for the overpressure or the or the
21 operating limit. We're just not to that point in
22 the core design.
23 So those are the representative numbers
24 that we submitted with our initial request. During
25 the initial submittal, the representative core

1 design was used to establish representative safety
2 limit CPR values.
3 Since then, we've been able to take
4 into account actual operating history and updated
5 uncertainties with the 0.03 adder above the line.
6 The Cycle 29 safety limit CPR values are shown on
7 the table.
8 I'm sure all of you can do math. And
9 1.15 plus 0.03 does not equal 1.19. Due to higher
10 uncertainties in the area above the line in EFW,
11 the base safety limit meg per is 1.16.
12 CHAIRMAN CORRADINI: Say that again,
13 please. I'm sorry. I can do the math, however,
14 what you're telling me is you're calculated with
15 uncertainties is a larger SLMCPR than simply the --
16 MS. MALANEY: Yes.
17 CHAIRMAN CORRADINI: Okay, fine.
18 MS. MALANEY: That's all I have here.
19 Here's the rest of the key results comparison. The
20 LOCA Appendix R and ATWS-I PCT results. Obviously
21 we don't have the PCT numbers up here for ATWS-I
22 because both the GE and AREVA numbers are
23 proprietary. So, if desired, we can talk about
24 them later.
25 CHAIRMAN CORRADINI: Yes, we'll come

1 back to that.

2 MEMBER REMPE: So, I have a question.

3 It's partially my ignorance, but when we approved

4 or recommended that the MELLLA+ be approved, one of

5 the features we cited was the tighter orificing of

6 the fuel inlet at Monticello.

7 And is that something that's totally

8 related to the tie plate, or is it something that's

9 a combination of the way the fuel assembly is made

10 and connected to the tie plates?

11 And where I'm going to is, we said oh

12 this is great, it's such a stable plant because of

13 the GE -- well, whatever the tighter orificing and

14 what causes that.

15 And is that going to still be there

16 with the AREVA fuel?

17 MS. MALANEY: The orifices are not in

18 the fuel.

19 MEMBER REMPE: It's not with the fuel

20 assembly. It's not where the nozzle connects to

21 the tie plate. It's totally --

22 MS. MALANEY: No. So, we have fuel

23 support pieces in the core.

24 MEMBER REMPE: Okay.

25 MS. MALANEY: And those are the same

since initial operation, unless we have to replace one.

MEMBER REMPE: Okay, so the assembly has no relevance on that chart? That's what -- thank you.

MR. UPENDRA: Just quickly. The numbers are really close to 2,200 F. Now are those numbers above the LOCA, are they with uncertainty or are they just the best estimate?

MS. MALANEY: They're Appendix K.

MR. UPENDRA: They're Appendix K. Okay, that's fine.

MS. MALANEY: Since ATWS-I is one of the big things here, we wanted to talk about the time critical operator actions for ATWS-I. There are no changes to our time critical operator actions for the transition to EFW.

We kept the 90 second to initiate level reduction, the 120 seconds to initiate the standby liquid control system and the 10 minutes to initiate torus cooling.

Additionally, now we have sensitivity studies that clearly identify the amount of margin associated with the operator action time for the initial level reduction.

1 And while our operation staff
2 understands and trains on the time-critical
3 operator actions, having the sensitivity studies
4 really kind of brings it home for them so that they
5 understand exactly how important their role is.
6 MEMBER REMPE: One thing that came up
7 with other plants, but we didn't discuss with your
8 plant, was the feedwater cooling transient. Did
9 you assume the same -- which was a very --
10 sometimes the plant would assume a very
11 conservative feedwater cooling transient time, and
12 then they'd say, well jeepers, we're having
13 instabilities. Let's go back to something that's
14 less conservative.
15 Did you assume the same as what you
16 assumed for the GE analysis with your AREVA
17 analysis?
18 MS. MALANEY: Yes, we did.
19 MEMBER REMPE: Okay.
20 MS. MALANEY: And it is very
21 conservative.
22 MEMBER REMPE: Good, thank you.
23 MR. UPENDRA: What is SBLC again?
24 MS. MALANEY: It's Standby Liquid
25 Control System. So it's the boron injection

1 system. CHAIRMAN CORRADINI: I've
2 never seen it with a B. All right, you guys are
3 redefining this one.
4 MS. MALANEY: We're an unusual plant
5 sometimes.
6 CHAIRMAN CORRADINI: Minnesota's
7 unusual, Jen.
8 (Laughter)
9 That was not -- take that off the
10 record.
11 (Laughter)
12 MS. MALANEY: And, finally, I have the
13 changes since our last brief. We've had some
14 MICROBURN-B2 and ATWS-I corrections. MICROBURN-B2,
15 there was a variety of items. And the ATWS-I, the
16 heat transfer coefficients needed to be
17 recalculated.
18 CHAIRMAN CORRADINI: So can I ask about
19 the first bullet?
20 MS. MALANEY: It's proprietary, so I
21 think it would be better to --
22 CHAIRMAN CORRADINI: Well, I'm not
23 going to ask any numbers. I'm just asking, give me
24 a chance. So, errors were noted. Has staff
25 reviewed that?

1 MS. MALANEY: Yes.

2 CHAIRMAN CORRADINI: Okay.

3 MS. MALANEY: We submitted one

4 supplement? Two?

5 CHAIRMAN CORRADINI: I didn't see it in

6 the SER, so maybe I missed it. I'll come back and

7 ask the staff that.

8 MS. MALANEY: Okay.

9 CHAIRMAN CORRADINI: Okay.

10 MS. MALANEY: The issues on both

11 subjects were identified by AREVA, corrected and

12 new results provided to the NRC via supplements.

13 As previously described, we have resolved, I think,

14 the application of the IMLTR safety limit CPR

15 adder.

16 And we're making progress in our Cycle

17 29 core design. Are there any questions or

18 comments that don't need to be deferred to the

19 proprietary section?

20 CHAIRMAN CORRADINI: Other questions by

21 the subcommittee? Okay. So, at this point, let us

22 stop and I'm going to ask the public line to be

23 open so that we hear crackling.

24 And anybody on the public line -- Can

25 we get the public line open please? And ask for

1 public comment now, since we're going to go closed
2 for the rest of the day anyway.
3 So can you get the public line open
4 please? Can somebody on the public line -- I hear
5 crackling -- at least acknowledge they're out
6 there.
7 JOHN FIELDS: Yes, this is John Fields
8 from Xcel Energy. We hear you fine.
9 CHAIRMAN CORRADINI: Okay, so is there
10 anybody from members of the public that want to
11 make a comment at this time, since we'll be going
12 into closed session for proprietary reasons for the
13 rest of the day?
14 Okay, I hear nothing. So we'll close
15 the public line. All right. And, unless we hear
16 any other comments from members of the committee,
17 this might be a good time to take a break.
18 So we'll switch over to closed session.
19 So the record will go on closed. I'd like the Xcel
20 and AREVA folks to check the room and help me
21 excuse people who aren't supposed to be here.
22 And then we'll go into closed session
23 following the break at 10:00 a.m.
24 (Whereupon, the above-entitled matter
25 went off the record at 9:45 a.m.)

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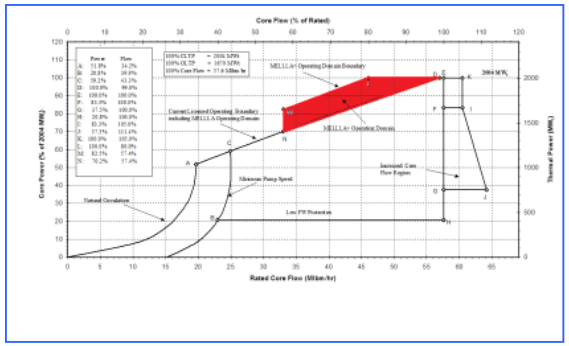
Extended Flow Window (EFW) License Amendment Request for Monticello Nuclear Generating Plant (MNGP)



ACRS T-H Subcommittee

Rockville, MD (2WFN)

September 19, 2016

Overview

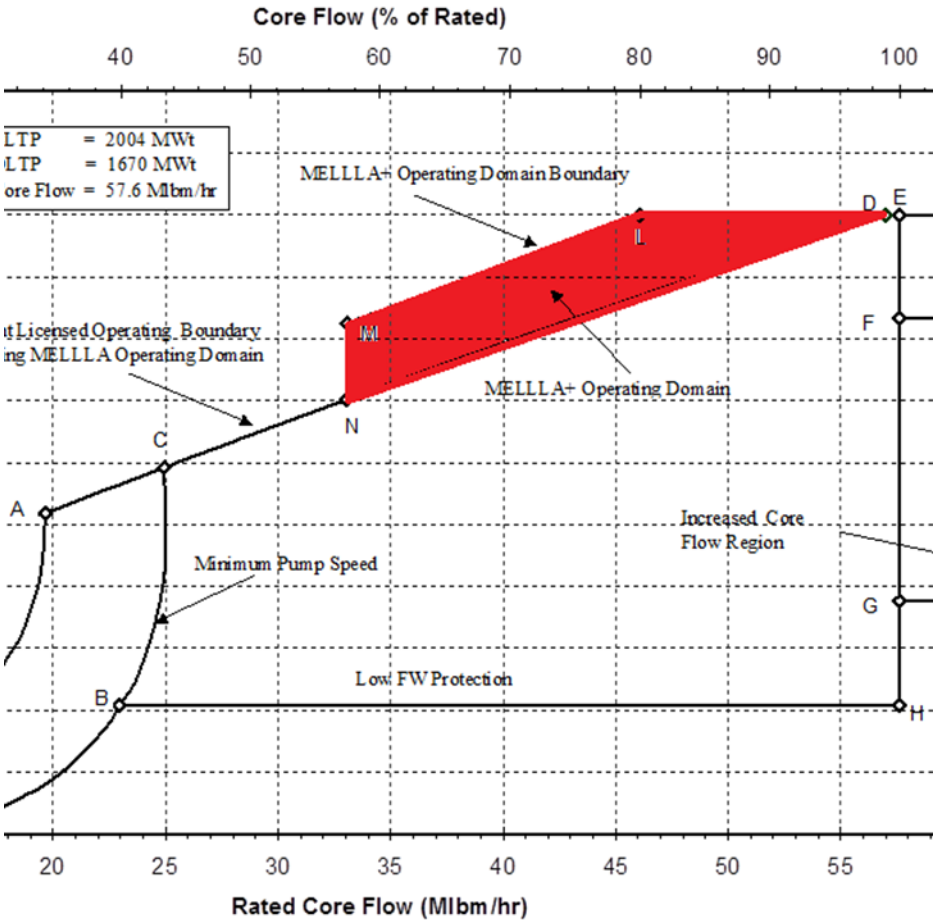
Meeting Purpose

- Explain purpose for MNGP EFW
- Explain scope of the EFW LAR
- Compare AREVA analysis with GE analysis
- Explain changes since 7/7/15 Info Brief

Overview

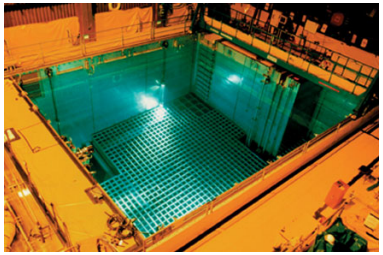
Nomenclature

- Extended Operating Domain (EOD)
- Maximum Extended Load Line Limit Analysis Plus (MELLLA+)
- Extended Flow Window (EFW)

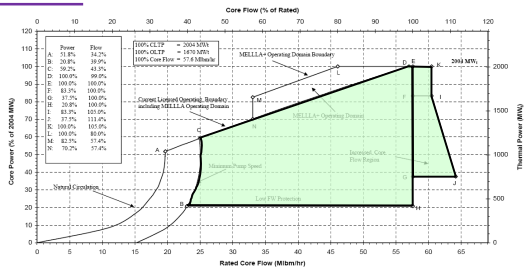


EFW LAR Overview

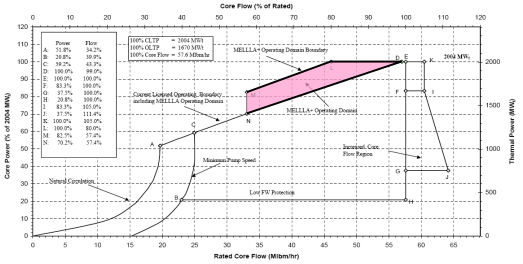
<u>AREVA Fuel Transition – 3 independent elements</u>



1. Fuel Storage Changes (Amendment 182 in 2014)
   - Approved AREVA criticality safety analysis methods
   - Allows ATRIUM 10XM storage in Spent Fuel Pool



2. Fuel Transition (Amendment 188 in 2015)
   - Approves AREVA reactor safety analysis methods
   - Analyzes ATRIUM 10XM operation at MNGP
   - Constrained to the approved MELLLA power-flow domain

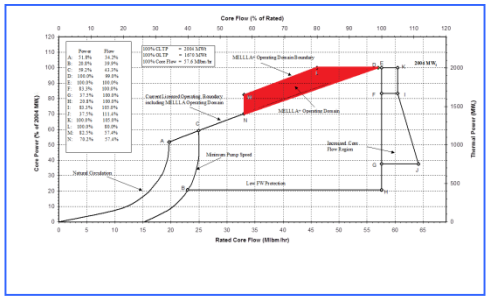


3. AREVA EFW (submitted 10-3-14)
   - Ensures continued full-power EPU capability
   - Extends AREVA analysis applicability into the EFW domain
   - Uses AREVA Enhanced Option III for Long Term Stability
   - Evaluates ATWS and ATWS-Instability in EFW
   - Six supplements, one pending

Overview

<u>Definition of Extended Flow Window (EFW) LAR</u>

- MNGP-Specific LAR; <u>not</u> a topical
- EFW region of power-flow map
- Implement in COLR
- Relationship with GE MELLLA+
  - Same power-flow domain as MELLLA+
- EFW replaces DSS-CD algorithm with a simpler reactor protection trip
  - Only physical change is re-installation of DSS-CD jumper



Plant Implementation

- Plant Changes
  - Install DSS-CD jumpers
  - Enable EFWS trip
  - Update power-flow map displays
  - Revise procedures, Tech Spec, and analysis

Plant Implementation

- Operation Changes
  - Minor impact to maneuvering
  - Stability solution
  - Higher probability of a plant scram following a recirc pump trip/runback

MNGP EOD Experience

- Normal operation in the MELLLA+ domain
- MELLLA+ testing complete in June 2015
  - Spike in MSL radiation during water level testing
- No stability events

EOD Analysis Progression

Global Evaluation of SSCs in the Extended Operating Domain			
ATWS-I	Global Plant Evaluation		
GE Methods TRACG, ODYN for onset of oscillation	LTR NEDC-33006 generic template for evaluating performance criteria in EOD.		
	Site-specific evaluation (SAR) of GNF fuel in EOD (approved in Amd 180).		

Applicability of Methods		Reactor Protection for Long-Term Core Instability Protection			
NEDC-33173 LTR		NEDC-33075 LTR	NEDC-33147 LTR		
Determines topically that GE methods are applicable in the EOD.		Topical for DSS-CD	Topical for TRACG		

EOD Analysis Progression

Global Evaluation of SSCs in the Extended Operating Domain			
ATWS-I	Global Plant Evaluation	ATWS-I	
GE Methods TRACG, ODYN for onset of oscillation	LTR NEDC-33006 generic template for evaluating performance criteria in EOD.	ANP-3274 ATWS-I Methods AISHA-SINANO	ANP-3284 MNGP Results PCT Acceptable
	Site-specific evaluation (SAR) of GNF fuel in EOD (approved in Amd 180).		
	Site-specific evaluation of AREVA fuel ANP-3295 with credit for Amd 180.		

Applicability of Methods		Reactor Protection for Long-Term Core Instability Protection			
NEDC-33173 LTR	ANP-3135	NEDC-33075 LTR	NEDC-33147 LTR	ANP-10262 LTR	LAR Encl 1 Attach 1
Determines topically that GE methods are applicable in the EOD.	Determines specifically that AREVA methods are applicable in the EOD for MNGP.	Topical for DSS-CD	Topical for TRACG	EOIII – topical method for determining channel instability exclusion region (CIER)	Develops site-specific reactor protection based on CIER.

EOD Analysis Progression

Global Evaluation of SSCs in the Extended Operating Domain			
ATWS-I	Global Plant Evaluation	ATWS-I	
	LTR NEDC-33006 generic template for evaluating performance criteria in EOD.	ANP-3274 ATWS-I Methods AISHA-SINANO	ANP-3284 MNGP Results PCT Acceptable
	Site-specific evaluation (SAR) of GNF fuel in EOD (approved in Amd 180).		
	Site-specific evaluation of AREVA fuel ANP-3295 with credit for Amd 180.		

Applicability of Methods		Reactor Protection for Long-Term Core Instability Protection			
	ANP-3135			ANP-10262 LTR	LAR Encl 1 Attach 1
	Determines specifically that AREVA methods are applicable in the EOD for MNGP.			EOIII – topical method for determining channel instability exclusion region (CIER)	Develops site-specific reactor protection based on CIER.

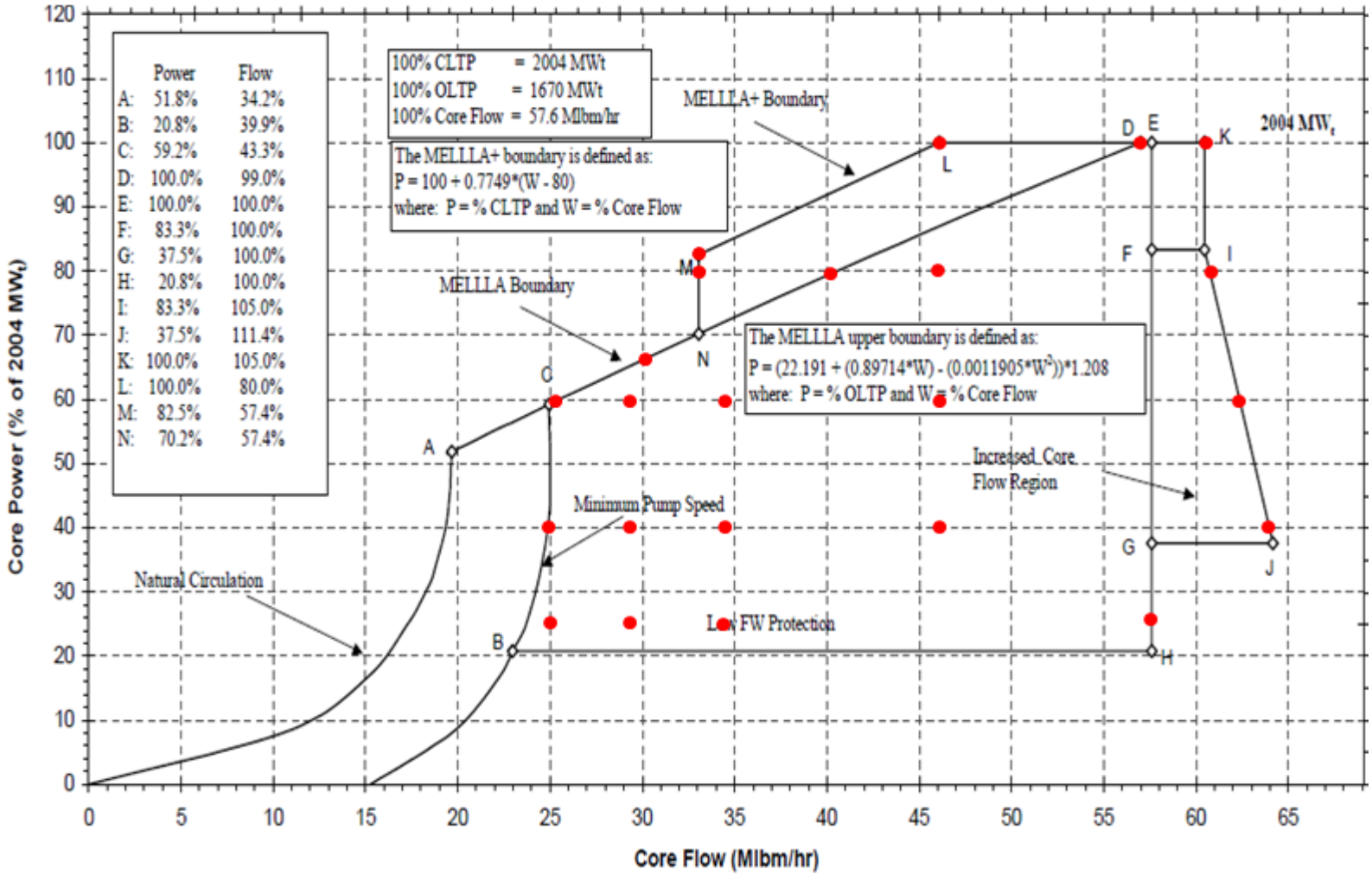
Key Analysis Points

1. AREVA methods applicable in EFW
2. Meet limitations of MELLLA+ LTRs
3. Comparison of MELLLA+ / EFW Results

AREVA Methods Applicability

- AREVA Methods applicable in EFW
  - Described extensively in LAR (ANP-3135)
  - No SER restrictions on power or flow
  - Example: SPCB and ACE CPR correlations

AREVA Analysis Statepoints



MELLLA+ Limitations

All conditions & limitations addressed in LAR supplement

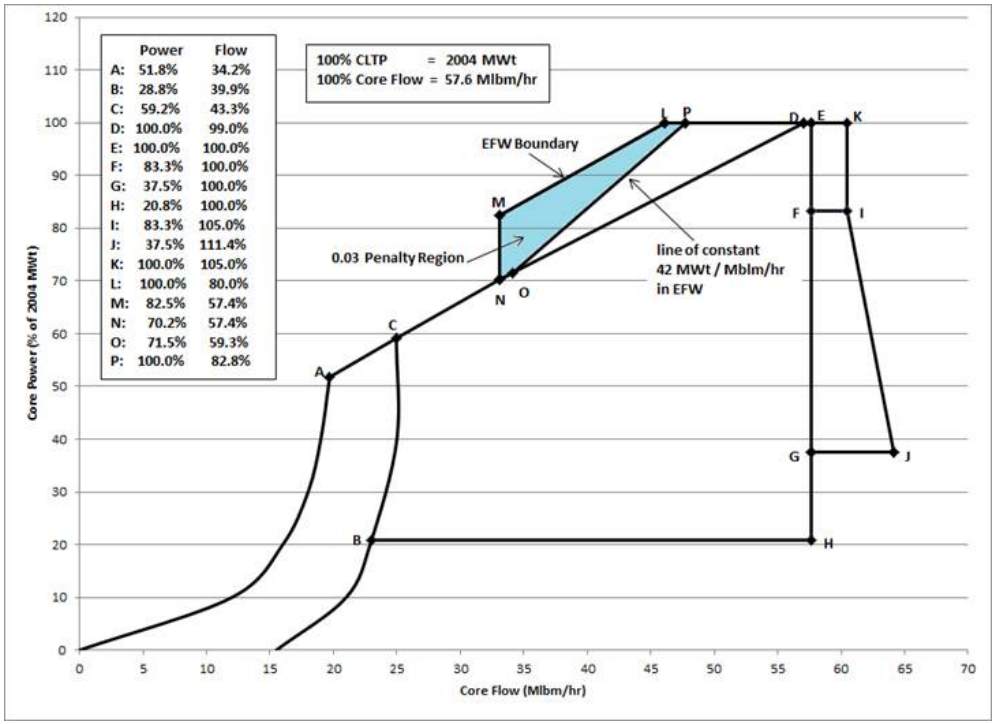
- NEDC-33173 L&C 9.3 requires that EODs are either limited to 50 MWt/Mlb/hr or provide additional information regarding uncertainties. Met because the MNGP EOD is < 50 MWt/Mlb/hr

Not applicable example:

- NEDC-33173 L&C 9.14 requires that the Part 21 on GESTR-M related to thermal conductivity degradation must be applied until the NRC staff informs GE of its conclusions. Not applicable because thermal conductivity degradation already addressed in AREVA methods.

NEDC-33173 Limitation 9.5

- NEDC-33173 requires SLMCPR adder of 0.03 when operating ≥ 42 MWt/Mlb/hr
- New SLMCPR Technical Specification Safety Limits to apply this 0.03 adder only when ≥ 42 MWt/Mlb/hr in the EFW region



Key Results Comparison

Analysis	GNF	AREVA	
SLMCPR		Submittal	Cycle 29
TLO (≥ 42 MWt/Mlb/hr in EFW)	1.15*	1.12**	1.19
TLO (< 42 MWt/Mlb/hr)	1.15*	1.12**	1.15
SLO	1.15*	1.13**	1.20
OLMCPR		GE14	XM
100%P, NSS, EOFP	1.62	1.53	1.55
Peak vessel pressure (psig)			
ASME	1344	1361	
ATWS	1489	1452	

***GNF SLMCPR includes 0.03 adder**

****AREVA submittal SLMCPR not including 0.03 adder**

Key Results Comparison

Analysis	GNF	AREVA
LOCA PCT (°F) (inc. 50.46) 102P/105F 102P/80F 84.5P/57.4F	2170	2130 2122 2064
Appendix R PCT (°F)	MELLLA+ not limiting	EFW not limiting
ATWS-I PCT (°F) (2RPT)	<2200*	<2200*

***Specific values are proprietary**

Nonproprietary slide -- ATWS-I PCT value is not shown

Results Comparison – ATWS-I

No changes to operator action times required:

- 90 sec to initiate level reduction
- 120 sec to initiate SBLC
- 10 min to initiate torus cooling

Changes Since 7/7/2015 Brief

- MICROBURN-B2 corrections
- ATWS-I correction
- SLMCPR adder resolution
- Progress in core design for Cycle 29

Acronym List

- ABSP - Automatic Backup Stability Protection
- ACRS - Advisory Committee on Reactor Safeguards
- ATWS – Anticipated Transient Without Scram
- ATWS-I – ATWS with instability
- BOC – Beginning of Cycle
- BSP – Backup Stability Protection
- BWR – Boiling Water Reactor
- BWROG - Boiling Water Reactor Owners Group
- CDA – Confirmation Density Algorithm
- CHF – Critical Heat Flux
- CIER - Channel Instability Exclusion Region
- COLR – Core Operating Limits Report
- CPR – Critical Power Ratio
- CPROM – Critical Power Reduced Order Model
- DR – Decay Ratio
- DSS-CD – Detect and Suppress Solution - Confirmation Density
- EFW – Extended Flow Window
- EFWS – Extended Flow Window Stability
- EO-III – Enhanced Option III
- EOC – End of Cycle
- EOD – Extended Operating Domain
- EPU – Extended Power Uprate
- GEH – General Electric - Hitachi
- HTC – Heat Transfer Coefficient
- KATHY – Karlstein Thermal-Hydraulic
- LAR – License Amendment Request
- LOCA – Loss of Coolant Accident
- LTR – Licensing Topical Report
- MCPR – Minimum CPR
- MELLLA - Maximum Extended Load Line Limit Analysis
- MELLLA+ – MELLLA Plus
- MNGP – Monticello Nuclear Generating Plant
- MOC – Middle of Cycle
- MWt – Megawatts Thermal
- NRC – Nuclear Regulatory Commission
- OPRM – Oscillation Power Range Monitor
- PCT – Peak Clad Temperature
- PRNMS – Power Range Neutron Monitoring System
- RTP – Rated Thermal Power
- TLO – Two Loop Operation
- TS – Technical Specifications

Operations Crew

Reactor Operator

Lead Operator

Balance of Plant Operator

Control Room Supervisor

C.5-3205: Terminate and Prevent

PART E of the procedure directs the operator to stop Feedwater and Condensate from injecting into the Reactor

This step initiates a TCOA

for mitigation of an ATWS event

TCOA completed at ≈ 58 seconds

Analysis assumption ≤ 90 seconds

Initiate Standby Liquid Control

This is a one step evolution to Inject Boron

This step initiates and completes a TCOA for mitigation of an ATWS event

TCOA complete $\approx$ 69 sec

Analysis assumption is $\leq$ 120 sec

C.5-3205: Terminate and Prevent

PART E: Condensate and Feedwater termination is completed

Feedwater & Condensate Terminated ≈ 62 sec

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