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NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

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POWER UPRATE SUBCOMMITTEE

OPEN SESSION

+ + + + +

TUESDAY

DECEMBER 3, 2013

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ROCKVILLE, MARYLAND

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

COMMITTEE MEMBERS:

JOY REMPE, Chairman

RONALD G. BALLINGER, Member

SANJOY BANERJEE, Member

MICHAEL L. CORRADINI, Member

STEPHEN P. SCHULTZ, Member

ACRS CONSULTANT:

KORD SMITH

DESIGNATED FEDERAL OFFICIAL:

PETER WEN

NRC STAFF:

STEVE BAJOREK, RES

TERRY BELTZ, NRR

TAI HAUNG, NRR

CHRIS JACKSON, NRR

JOHN MONNINGER, NRR

PETER YARSKY, RES

ALSO PRESENT:

JENS ANDERSON, GE Hitachi

MIKE COOK, GE Hitachi

JOHN GRUBB, Xcel Energy

STEVE HAMMER, Xcel Energy

CHARLIE HECK, GE Hitachi*

RANDY JACOBS, GE Hitachi*

JOSE MARCH-LEUBA, ORNL

MARK SCHIMMEL, Xcel Energy

RICK STADTLANDER, Xcel Energy

JUSWALD VEDOVI, GE Hitachi

*Present via telephone

T-A-B-L-E O-F C-O-N-T-E-N-T-S

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

(8:31 a.m.)

CHAIRMAN REMPE: So this meeting will now come to order. This is the meeting of the ACRS Power Uprate Subcommittee and I'm Joy Rempe, Chairman of the Subcommittee.

ACRS Members in attendance today include Mike Corradini, Sanjoy Banerjee, Ron Ballinger, and Stephen Schultz. We also have our Consultant, Dr. Kord Smith, present, and Peter Wen of the ACRS Staff is the designated Federal Official for this meeting.

The purpose of this meeting is to review the Monticello Maximum Extended Load Line Limit Analysis Plus, or MELLLA+, Licensed Amendment Request to the Associated Staff Draft Safety Evaluation.

We're going to hear presentations today from the NRC Staff and the Licensee, Northern State Power Company of Minnesota, or NSPM. The Subcommittee will gather information, analyze relevant issues and facts, and formulate the post-positions and actions as appropriate for deliberation by the full committee.

As shown in the agenda, some of the presentations today will be closed in order to discuss information that's proprietary to the Licensee and its

contractors pursuant to 5 USC 552(b)(c)(3)(4).

Attendance at this portion of the meeting dealing with such information would be limited to the NRC Staff, Licensee representatives and its consultants and those individuals and organizations who've entered into an appropriate confidentiality agreements with them.

Consequently, we need to confirm that we have only eligible observers and participants in the room and that the phone lines are appropriately closed for this portion.

And we're going to ask you to not only help us make sure that we do have the appropriate here, but if we start asking questions that you feel are proprietary, just tell us and we'll hold off for the answer to it.

The rules for participation in today's meeting have been announced as part of the notice for this meeting, previously published in the Federal Register.

And the detailed procedures for the conduct of and participation in this meeting were published in the Federal Register on November 8, 2013, 70(a) CFR 67205, 67206.

We've received no written comments or requests for time to make oral statements from members

of the public regarding today's meeting. A transcript of the meeting is being kept and will be made available as stated in the Federal Register Notice.

And so, therefore, we request that participants in this meeting use the microphones located throughout the meeting room in addressing this Subcommittee.

And participants must first identify themselves and speak with sufficient clarity and volume so they could be readily heard. So now we're going to proceed with the meeting and I'm going to call on Mr. John Monninger, of the NRC Staff to begin.

MR. MONNINGER: Good morning, Dr. Rempe, and fellow ACRS Members. My name is John Monninger, I'm the Deputy Director of the Division of Operating Reactor Licensing within NRC's Office of Nuclear Reactor Regulation.

We, the Staff, are pleased to be here today, to discuss the status of our review of the Monticello MELLLA+ Application. As you'll hear today, starting with our Senior PM, Terry Beltz, it is related, though not directly joined, to the EPU Application, which we had briefed the ACRS Subcommittee and Full Committee on two times this past Fall.

In regards to that, the Application, the Amendment for the EPU is very close to finalization and issuance, so I just thought I'd mention that. It may be of some interest to you.

As we've noted in the past, this Staff does take tremendous benefit in the comments and questioning from the ACRS. It provides a good review for our independent safety evaluations that we do conduct.

So with that, I'll just turn it over to, as I mentioned, Terry Beltz, he's our Senior PM for the Monticello site. And we thank you all very much in advance for your comments and questions today.

MEMBER CORRADINI: Just remind me, this is the first application, though, for us, is that correct?

MR. MONNINGER: Yes.

MEMBER CORRADINI: Okay.

CHAIRMAN REMPE: So I was going to do this later, but since we're talking about process and things like that now, this application is solely for GE fuel.

And with respect to process, if an applicant were to decide to switch to the fuel of another vendor or, you know, what would be the process for that, would they need to have similar types of documents and what happens with the mixed core mode and does it come back

to ACRS, or what's the procedure for that?

MR. MONNINGER: So the front half of the questions are probably easier than the second half, whether it comes back to the ACRS or not. Of course, well, I could answer the second half.

Any topic, of course, that the ACRS is interested in, you know, the staff is, of course, held accountable to comment on and brief you. I don't think, generally, we would comment with that. I think we would view it more as a routine licensing action, or routine licensing amendment.

But if the ACRS was interested in it, we would ensure that we did deliver on that. So I'm not sure whether Terry or Chris want to discuss if there was an amendment with different fuel or mixed fuels?

MR. JACKSON: Yes, I can help a little bit. Okay, so Monticello's the first application of MELLLA+. We have received two additional applications and they're in the acceptance review phase. We haven't accepted them yet, but their acceptance is imminent.

So the first one is Monticello, the second one is Grand Gulf at Nine Mile Point, so those will be coming through, as well. Now --

CHAIRMAN REMPE: But they're all GE fuel?

MR. JACKSON: All GE fuel. Well, I mean, it's in the acceptance review, I believe they're all GE fuel, but I'm not certain.

CHAIRMAN REMPE: Okay.

MR. JACKSON: So if the MELLLA+ topical report is in fact limited to GE fuel, so you couldn't use that topical report free and clear with some other fuel design, or from some other fuel.

So it would require an amendment and would require NRC review and approval. So that's being contemplated, there's a public meeting tomorrow for Monticello to discuss how they plan to do that.

So we're expecting an application next year for Monticello to do that. And we're going to have to, you know, outline a plan, a strategy. We got a public meeting tomorrow to discuss it. We got our technical staff, as well as research coming to discuss that.

So if you were to use another fuel design you would go back to MELLLA Flow rather than MELLLA+. So we actually have an application for Monticello in-house right now for AREVA fuel at MELLLA conditions.

And that would be a routine license amendment and I wouldn't expect ACRS to be interested in that. But, MELLLA+ Flow regime, or extended flow regime

in the AREVA parlance, I would expect ACRS to have interest in that and we're happy to accommodate the ACRS interest in them.

MEMBER CORRADINI: Can I say it back to you, so I get it right? So if they fall back to the MELLLA region, it doesn't come here because that's all past history?

MR. JACKSON: Right. Unless, of course, you want it to.

MR. MONNINGER: Moving on --

MR. JACKSON: But I'll leave it --

MEMBER CORRADINI: I think --

(Simultaneous speaking.)

MEMBER CORRADINI: Listen to my own advice. I don't want to speak for anybody else.

(Simultaneous speaking.)

(Laughter)

MR. JACKSON: Yes.

MEMBER CORRADINI: Okay, so that's point one. Point two is that if they choose to go in the MELLLA+ region, then you, the staff, would have to see some sort of justification with some calculations and analysis with the new fuel and that would come for review here?

MR. JACKSON: Yes, sir.

MEMBER CORRADINI: Okay.

MR. JACKSON: And it would be, there's a public meeting tomorrow that we'll go through everything and it would have, you know, several pages and like --

MEMBER CORRADINI: Whether it'll be partial or a complete changeover.

MR. JACKSON: Right.

MEMBER CORRADINI: So the partial, we would see a mixed core as the first incoming --

MR. JACKSON: Yes.

MEMBER CORRADINI: Okay.

MR. JACKSON: But you would, the difficult part for me would be shifting to AREVA method. So, you know, there's numerous ways you could do it correctly, or do it safely. They got to choose one.

But if you go to AREVA methods and the AREVA methods have to be justified for MELLLA+, you know, for whatever flow regime they want. Then you can be told those things need to be ironed out.

MEMBER CORRADINI: Okay. Thank you.

MR. JACKSON: It's just sort of multi-faceted.

MEMBER BANERJEE: So you're going to brief

us on this, at some point, as to what the span you would be leaving with this?

MR. JACKSON: We can.

MEMBER BANERJEE: Yes.

(Simultaneous speaking.)

CHAIRMAN REMPE: I think that might be something we might want to request, with a letter or something.

MEMBER BANERJEE: Yes, even if informally, then we'll know whether we really want to hear this, and I suspect we will.

MR. JACKSON: Okay.

MEMBER BANERJEE: You know, to call the methods up, as we know.

MR. JACKSON: Yes.

MEMBER SCHULTZ: And a briefing is the right place start right now.

MEMBER BANERJEE: Yes.

MEMBER SCHULTZ: And I believe that briefing ought to cover both, the mixed core issues, as well as the licensing methodology changes that are associated with the new vendor and fuel.

MR. JACKSON: So after tomorrow's public meeting I think we'll have a reasonably good idea of what

this strategy is and we won't make a finding or conclusions to whether that's a good approach, but we'll come back and develop a licensing strategy or plan for that.

And, you know, we're ready for that meeting. We'll have our colleagues from Research here as well.

MEMBER BANERJEE: Okay.

MR. JACKSON: And the Applicant may be able to provide some insights as to how that works. We had a public meeting with another licensee, I believe it was Nine Mile, but my staff can correct me, because I always get the plants confused, but they had a slightly different approach and we'll get an application next year as well. So it's an interesting topic, but it's --

MEMBER BALLINGER: It's been in two other plants, or three, that are --

MR. JACKSON: We had two other plants --

MEMBER BALLINGER: -- two, Nine Mile and Grand Gulf?

MR. JACKSON: -- seeking MELLLA+ flow regime. Then we also had a meeting with a plant that wanted to use a MELLLA+ flow regime with the re-fuel, so --

MEMBER BALLINGER: Oh.

MR. JACKSON: -- it's doable, but it will require a review and then we --

MEMBER BANERJEE: You mean the GE methods with the re-fuel?

MR. MONNINGER: No.

MR. JACKSON: So --

MR. MONNINGER: With the standard MELLLA+ --

MEMBER BANERJEE: So let's --

MR. JACKSON: No, you're right, John, it's the parlance and --

MR. MONNINGER: Yes.

MR. JACKSON: -- AREVA terms has extended flow was quite different.

MEMBER BANERJEE: So you mean extended flow methods?

MR. JACKSON: Yes. So that'll be, you know, an area of significant review for us, we see many plants interested in that. And we'll come up with an approach and share it with the Advisory Committee.

I'll leave it to John to develop a schedule or a plan. I mean, traditionally, our approach would be to develop an SCR and then come to the Advisory Committee, but I think the earlier meeting, planning meeting --

CHAIRMAN REMPE: I think so.

MR. JACKSON: -- would, personally, be a good idea.

MEMBER BANERJEE: I think we've seen the methods for both MELLLA+ and extended flow. I think we've seen both.

MEMBER CORRADINI: I think we've seen something, but I don't think don't think we've seen those big tanks.

MEMBER BANERJEE: I do not think I've seen the complete, maybe you could --

MR. HUANG: Yes, this is Tai Huang. Yes, the ACRS already reviewed the extended flow --

MALE PARTICIPANT: Right.

(Off the record comments)

MR. HUANG: This is Tai Huang. The ACRS has reviewed these a few weeks ago without extending flow renewal mixed authority for AREVA?

MEMBER BANERJEE: Yes, I remember that.

MR. HUANG: You did that.

MALE PARTICIPANT: You were the Chair.

MEMBER BANERJEE: Yes.

MR. HUANG: Yes.

MEMBER BANERJEE: And I was also the Chair

for the MELLLA+.

MR. HUANG: Yes, that's right. And that's like now for us the mixed core issue. Remember, we had for MELLLA+, there's two or three or five question there, designed to the mixed core review.

So they can either check that, you know, transition that you're possibly, maybe, I'm not there but this is my guess, and they use possibly authority, the top up there, AREVA, you follow our applicability topical report. We can do that, you know, follow that, I don't know.

MEMBER BANERJEE: Yes, because the mix, I can see with AREVA core, GE core, it's clear, I mean, everything is straight. But mixed core what you're going to do with these, yes. You're laughing.

(Off microphone discussion)

MR. JACKSON: Did that answer your question --

CHAIRMAN REMPE: Yes, and I think --

MR. JACKSON: Okay.

CHAIRMAN REMPE: -- we all agree, we should have some additional discussions and --

MR. JACKSON: The Advisory Committee Staff may want to come to the public meeting tomorrow .

CHAIRMAN REMPE: There's supposed to be another meeting, so we'll try and see what we could do, okay?

MR. JACKSON: Okay.

CHAIRMAN REMPE: Thank you.

MR. BELTZ: All right, good morning. My name's Terry Beltz. I'm the Senior Project Manager in the Division of Operating Reactor Licensing, and I'm assigned to the Monticello Nuclear Plant. Again, on behalf of the NRC Staff, I'd like to take the opportunity to thank the ACRS Members for accommodating this MELLLA+ review of Monticello.

Before continuing with the discussion of the Agenda, I'm just going to just briefly go over the timeline, as John mentioned, the EPU and MELLLA+ were tied during the review process.

The EPU Application, itself, came in on November 7th of 2008. In November of 2009, DORL management accrued linking the MELLLA+ Amendment with the EPU Application because the MELLLA+ Application referenced and the analyses was performed at EPU conditions.

So the staff approved looking at both applications due currently. In January 2010 the MELLLA+

application was submitted to the NRC and in March of 2010 it was accepted for review.

Going back a little bit, in October 2009, the reviews were placed on hold, and this was to resolve the issues regarding containment accident pressure. And in March of 2011, the EPU was reactivated in addition to the review of the MELLLA+, was also recommenced.

Just a brief background on the review. We had seven application and supplements to the MELLLA+. There were eight responses to REIs. And, also, during the course of the staff's review there was an audit conducted at GE Hitachi and that material is also on the docket.

The agenda for today, Xcel Energy will begin with an overview of the MELLLA+, as Dr. Rempe mentioned, following, I guess, the first break, we'll close the session as everything, the remainder of the morning and into the afternoon is, proprietary information will be discussed.

After the break Xcel Energy will go over Nuclear Design and Safety Analyses, Discussion of Training and Simulator, and MELLLA+ Testing. The afternoon session, the NRC staff will give presentations on Safety Analyses and TRACE Confirmatory Analyses.

And that's all I have, if anyone has any questions. If not, I'll turn it over to Mr. Mark Schimmel with Xcel Energy.

(Off the record comments)

MR. SCHIMMEL: Good morning.

CHAIRMAN REMPE: Good morning.

MR. SCHIMMEL: How are you today?

CHAIRMAN REMPE: Fine.

MR. SCHIMMEL: Now, well, first of all, we're glad to be here to have this opportunity to present. We do appreciate the opportunity to present the MELLLA+ to the ACRS as it relates to the Monticello Extended Power Uprate.

There's been a lot of work that's went into this on all parties involved, from ourselves to the vendors, even to, the NRC put a lot of time into this and I think we're well-positioned to answer the questions as they come up today.

And if for some reason a question comes up that we can't answer it we will tell you we can't answer it and we'll find the right person to get you the answer. That's the cleanest way to do it.

We do have some support in the audience if we have to call on them for some help we will do that.

And if we can't we'll just follow-up and tell you we'll give you a follow-up and get back to you on the time that we agree to.

All right, the presenters today are myself, Mark Schimmel. I'm the Vice President for Xcel Energy Nuclear. I will discuss the plan overview and how the big picture, timeline, and how we kind of got here where we're at today.

Then I'll turn it over to John Grubb, which is the Technical Assistant to the Monticello Vice President and he'll talk about the implementation of MELLLA+.

John will turn it over to Mr. Hammer, to the far left here, and John will, Mr. Hammer is the Project Manager for MELLLA+, been engineering most of his career, and he will discuss the Design and Safety Analyses as we go through this today.

And lastly, we'll turn it over to Mr. Rick Stadtlander who is the Monticello Assistant Operations Manager and the Senior License Holder at Monticello.

He will talk about the training and plan operational-type aspects of MELLLA+ and can answer any questions regarding how the plant's operated or what the operators will actually see and how it will be handled.

The next couple slides, it talks about the background, Monticello -- is there a question? Okay. Monticello, the original license was issued in 1970, in September of '70.

We went commercial on June 30th of 1971 and then it took about another year to get the full-term operating license approved, which we did in January of '81.

It's a BWR/3 with a Mark 1 Containment, which everybody should be very familiar with. The original license thermal power limit was 1670 megawatts thermal.

And then we did a little power uprate in '98 to re-rate the units primarily down to the secondary side through some turbine work and Steve can talk in greater detail and present questions on that, it took us to 1775 megawatts thermal.

And then we have set for most of the members of this Committee and requested the additional power uprate license, which is still in progress. It takes us from 1775 all the way up to 2004 megawatts thermal.

MEMBER CORRADINI: Okay, without, just to remind us, I remember you explained this to us, but I don't remember, without MELLLA+ you can go to what?

MR. BELTZ: Well, I don't have -- Rick, you want to discuss that?

MR. STADTLANDER: Right. Excuse me. What we've determined up to this point is that we can comfortably operate at about 1880 megawatts thermal.

We believe we could, without MELLLA+ we'll be able to do our testing up at 1908 megawatts thermal, but then to give the operators a good operating window, we're going to have to come down to that 1880 megawatts thermal.

MEMBER CORRADINI: Right.

MR. SCHIMMEL: It just tightened up too much.

MEMBER CORRADINI: Right. I understand. I just wanted to make sure, I couldn't remember the numbers, but thanks.

MR. STADTLANDER: Okay, yes.

MEMBER CORRADINI: Thank you.

MEMBER BANERJEE: Of what percentage of flow over 100 percent can you go, can you go comfortably at all?

MR. SCHIMMEL: One hundred percent flow is what we --

MR. HAMMER: You want me to take that?

MR. STADTLANDER: Go ahead, Steve.

MR. HAMMER: Yes, it's Steve Hammer in Monticello. We can't really get to 100 percent core flow now at EPU.

MEMBER BANERJEE: Okay.

MR. HAMMER: The impact of EPU over CLTP is we lose about 1.7 percent on core flow capability. And at the maximum capability you've got, varies a little bit, depending on whether you're top peaked or bottom peaked, but we expect to be about what, a 96 percent core flow capability.

MEMBER BANERJEE: Okay. So it's actually cut down?

MR. HAMMER: Yes. We are licensed for 105 percent core flow.

MEMBER BANERJEE: Yes.

MR. HAMMER: It's just that we don't have, the equipment can't support that right now.

MEMBER BANERJEE: Okay.

MEMBER CORRADINI: Is there a plant or an equipment change-out, I don't remember, I'm sure we asked this and I just don't remember.

MR. HAMMER: No.

MR. SCHIMMEL: We had not approved any

equipment up to this point --

MEMBER CORRADINI: Okay.

MR. SCHIMMEL: -- we had talked about it, which was probably what jet pumps --

MEMBER CORRADINI: but with MELLLA, okay, thank you.

MEMBER BANERJEE: So that's also partially why you're limited to the 18 --

MR. SCHIMMEL: That's correct.

MEMBER BANERJEE: -- 96, or whatever that number is.

MR. HAMMER: Yes.

MEMBER BANERJEE: Okay. So you really need the MELLLA+.

MR. HAMMER: Yes.

(Off the record comments)

MR. SCHIMMEL: Again, implementation of MELLLA+ does allow us to get to the full power uprate that was requested. The next couple of slides, basically, is just a basis for how we addressed MELLLA+.

And the whole point of the next two slides really is just to let you know that we've only used previously approved NRC approaches to acceptable methods to determine this.

On the next slide you're going to see a list of the road map that we followed through the NEDCs to derive that, you know, we used these license topical reports to get there. So the whole message here is we just followed, the road map we used was previous approved documentation to get here.

MEMBER BANERJEE: Were there any exceptions that you needed to any of these things?

MR. HAMMER: There are a couple of exceptions --

MEMBER BANERJEE: Yes.

MR. HAMMER: -- and we'll talk about those.

MEMBER BANERJEE: All right. Because I noticed there were.

CHAIRMAN REMPE: It would help if you'd make a real point to say, emphasis that point, too, as you go along, please.

MALE PARTICIPANT: Yes.

MR. SCHIMMEL: We can do that. Unless there's any questions on that, I think what I'd do now is I would turn this over to John Grubb. He's going to talk about the implementation of MELLLA+.

MR. GRUBB: All right again, my name's John Grubb, I'm Assistant to Site Vice President. I thank you

for the opportunity to be here. What we're looking at here is the MELLLA+ Power Flow Map for Monticello. The red region represents the MELLLA+ Operating Domain.

And as Mark hinted at earlier, the real reason Monticello would like to get the MELLLA+ is for operational flexibility. Up at full EPU power levels we really have almost no opportunity to make power adjustments other than with moving rods.

That is allowable, we can do that, but it represents additional human factors, risk for errors and the way we've operated the plant primarily for the last 40-some years is taking those minor power adjustments with flow and that's what the MELLLA+ Operating Domain allows us to continue.

So that's really the point on this slide. Now this will be discussed a little bit later during the NRC's portion. They'll talk specifically about that, kind of at a point on the power flow map where we would be somewhat restrained without the MELLLA+. Next slide.

MEMBER CORRADINI: So just to clarify, so Point D is the flow where you're restricted to because of --

MR. HAMMER: Yes.

MEMBER CORRADINI: -- C, B. Okay, got it.

Thank you.

MR. GRUBB: Changes based on MELLLA+, again, an expansion of the operating domain, as I mentioned earlier, the power flow map, there are a couple of instrument and alarm setpoint changes that will be done as part of the MELLLA+ implementation.

Core flow has been analyzed as low as 80 percent, this is all under our EPU Conditions. And the tech spec changes to implement DSS-CD Long-term Stability Solution would also be done under MELLLA+.

What does not change under MELLLA+? Maximum license power level does not change. Maximum licensed core flow, maximum licensed plant vessel dome pressure does not change.

There's no balance of plant equipment changes to implement MELLLA+, and no major hardware changes are required to support MELLLA+. There is a jumper that we will remove in our PRNM System to enable the DSS-CD method. Next slide.

Relationship EPU, we are constrained at full EPU conditions. And as we noted on the power to flow map, all of our MELLLA+ analyses did assume EPU conditions.

System parameters are bounded, so there's

just a list of things here that, all of which were bounded by our EPU conditions, main steam and feedwater temperatures, flows, pressures, you can look at the list there, but there's really, from an operational standpoint, very little change from a MELLLA+ standpoint. Next slide.

CHAIRMAN REMPE: Okay, so probably Peter needs to go do some things to make sure we've switched our lines and things are appropriately closed up before you go any further.

MR. YARSKY: Okay.

CHAIRMAN REMPE: And for the record, we're going to go to a closed session.

(Whereupon, the foregoing matter went off the record at 8:57 a.m. and went back on the record at 5:22 p.m.)

CHAIRMAN REMPE: Okay, so first we do they do the public. Are there any people here in the audience that want to make any statements at this time?

And what about the phone lines, are any people out there, first of all, because we can't really tell unless someone speaks up and says that they're there. And since no one's saying anything I guess that takes care of the public comment.

So let's go around the table then and, Mike, would you like to go first?

MEMBER CORRADINI: Yes. I guess I didn't appreciate that these heat transfer issues that don't affect Monticello directly, but if they didn't have successful operator reaction at times they did would have affected another individual's analysis in this regard.

I didn't realize they kind of interweave with this, and I guess I would think this is a generic issue that the thermal hydraulics committee ought to take up so that we understand it better.

Because I really do think that this affects things more than I guess I first, when I looked at the slides I didn't appreciate the inter-connection and I think it's important to understand a bit.

CHAIRMAN REMPE: Would the Chairman of the thermal hydraulics committee like to --

(Laughter)

MEMBER CORRADINI: Well I want to give somebody some work to do.

MEMBER BANERJEE: I just want to make sure that he attends the meetings.

(Laughter)

(Simultaneous speaking.)

MEMBER BANERJEE: He's very good at avoiding thermal hydraulics meetings. All right, leaving that aside now. I think the case made for the MELLLA+ is strong, but I don't see any issues really for the first order.

The issue that had worried I think many of us, I'm sure, is this, related to ATWS. That seems to be taken care of with the 90-second operator action, which they've just given us reasonable assurance it can be done in time.

The part of it that I'm still concerned about is whether that, what's the margin to onset of instability? Because once those instabilities start things are pretty much very, very difficult to control I would think really calculating.

So, you know, it sounds from Peter, but maybe this needs to be a little better assessed, that you've got enough margin, you know, with the 90 seconds. And if that's true then I'm quite happy with this.

CHAIRMAN REMPE: So what would you want to see to demonstrate if you addressed in a certain --

MEMBER BANERJEE: You know, I don't know if we need to see anything. What we need to do for it probably is with a little bit more, get a little bit more analysis to show that nothing starts within ten, 20, 30 seconds, or no oscillations start.

I mean I don't know if the staff has done, whether they've done any linear stability analysis or something to support that. Maybe I should ask Jose or GE or somebody. Yes, go ahead.

MR. COOK: Yes, this is Mike Cook from GEH, there was some uncertainty in the time --

MEMBER BANERJEE: Right.

MR. COOK: -- and the generic time was based on 120 seconds.

MEMBER BANERJEE: Yes.

MR. COOK: And so we actually have a 120-second case that we had performed --

MEMBER BANERJEE: Right.

MR. COOK: -- and it was the same result effectively, so that's another, you know, 30 seconds there.

MEMBER BANERJEE: Yes. That's really what we would like to --

MR. COOK: So for Monticello, you know, 90 seconds is --

MEMBER BANERJEE: Is conservative.

MR. COOK: Yes.

MEMBER BANERJEE: Yes. And you've got plenty of margin.

MR. COOK: Yes.

MEMBER BANERJEE: So if you don't get it done till 100 seconds --

MR. COOK: Well there's at least, at least up to 120 seconds.

MEMBER BANERJEE: Okay. And that's oscillations at 120 seconds?

MR. COOK: Right.

MEMBER BANERJEE: Okay. And that doesn't get changed by noise or anything like Peter was saying?

MR. COOK: We also use a modic for that and it's not, I believe NRC has seen some sensitivity to that method of noise.

MALE PARTICIPANT: Yes.

MR. COOK: But we have not seen this.

MEMBER BANERJEE: So it's a finite aptitude effect probably, you know, so that occurred, but, okay.

MR. COOK: Yes. Well certainly at 90 seconds, you know, there's, you're not on the hairy edge there.

MEMBER BANERJEE: Okay. Thank you.

MR. BERES: Joel Beres. The other part of that total time, it's 90 seconds to initiate the feedwater stoppage, as the feedwater terminating, I think that's what we call it, and there's 15 seconds after that analytically.

In real life it takes four seconds to shut the valve, so there's another 11 seconds there and a very much complicated task for the operator to do. It's essentially, you take a switch with your finger and then you just hold it in. So it's a very complicated task.

MEMBER BANERJEE: Yes, so the thing is it probably takes as they pointed out 20 seconds or so, and maybe a little longer, for the effects to be really felt.

So if you switch it at 120 seconds you're going to get into oscillations and, you know, the level control will help you, but it will help you after you've

received substantial oscillations.

Whereas this way, even if it takes 20 seconds to come, it'll, you know, you won't get any oscillations at all, which is very helpful, that's nice.

But once you start to get oscillations I start to worry about the calculations and things like that. So, I'm done.

CHAIRMAN REMPE: Thank you. Ron?

MEMBER BALLINGER: I'm going to have to defer to my thermal hydraulic expert colleagues, but the difference between 90 and 100 seconds is not much to me. So I --

MEMBER BANERJEE: We defer to you on --

(Laughter)

MEMBER BALLINGER: Not yet. I just --

MEMBER BANERJEE: It's back at the operator --

MEMBER BALLINGER: -- we say well, we've got an extra four seconds, we've got an extra ten seconds, I don't know. It just seems to me like that's not, I think there's got to be fuzziness there somewhere and I know these are beyond design basis calculations and they're difficult to do and all that kind of stuff, but I don't know.

I just don't know that there's a difference between 90 and 100 seconds.

MEMBER CORRADINI: But I misunderstand 90, I thought --

MEMBER BANERJEE: It's 120.

MEMBER BALLINGER: Or the 100, I don't think that much, you know, with all these uncertainties I worry that there's not much difference between 90 and 120 seconds now. You think that's okay, so okay.

MEMBER BANERJEE: I think it's okay because GE has done some calculations. I don't, my feeling is that once you go into these large aptitude calculations there are a lot of uncertainties with regard to what phenomena there can be and so on.

But the onset of these oscillations you should be able to predict within, I would hope, 30 seconds. So --

MEMBER BALLINGER: Okay, 90, 100, 110, 120, okay, that's 30 seconds.

MEMBER BANERJEE: Yes. I would hope, but I don't --

MEMBER CORRADINI: You guys are not worried, you're worried about the operator reactor or the text of the suppression methodology.

MEMBER BANERJEE: Well there is --

MEMBER CORRADINI: That's what I was trying to understand.

MEMBER BANERJEE: There is no scram here.

MEMBER BALLINGER: I think the, you know, I can see the operators making the right decisions within 90 seconds. I'm just not sure, and again, I'm not a thermal hydraulic expert, what's the error on the 90 seconds?

(Simultaneous speaking.)

CHAIRMAN REMPE: On the onset --

MEMBER BALLINGER: You know, and so, the, you know, I want the experts --

MEMBER BANERJEE: Well that suppression I was asking Peter, you know --

MEMBER BALLINGER: Yes.

MEMBER BANERJEE: -- what do you feel is, and he's saying 20 seconds now I have to believe him, you know. I haven't done the calculations.

MEMBER BALLINGER: I mean some of these thermal hydraulic codes remind me of finite element codes where I asked a guy one time --

MALE PARTICIPANT: They're not that bad. They're better than them.

MEMBER BALLINGER: -- what's to stress, and he said well what do you want it to be.

(Laughter)

MEMBER BALLINGER: So, anyways.

MEMBER CORRADINI: I guess I, just to, my impression is that I'm not concerned because a lot of this stuff, I got to go back to, and these guys are caucusing back here now they've whistleblew.

My sense of it is a lot of these things have been benchmarked off of experiments and now you're either, I want to use the word extrapolating, but taking the benchmark calculations and using them in a real case.

So to me I'm not concerned about that. I'm more worried about the question you guys were asking the applicant relative to how the operators respond, and they respond way in advance of this stuff, however uncertain this stuff is.

So that gives me some confidence. I honestly don't have confidence, as the wiggles get bigger, I have less and less confidence. When the wiggles start, I have some confidence.

But if I start worrying about how they start doing this and this and this, I throw all of that out the window until we actually have an experiment that goes out

there.

But I do think we ought to ask staff, that I do think they've benchmarked this, and I don't remember, is it with the, some reactor experiments in the past, have you not done some of the analysis?

MR. JACKSON: TRACG is an NRC approved code for a lot of different things --

MEMBER CORRADINI: But I think what Dr. Ballinger was asking about is in terms of its abilities or staff's ability to predict oscillatory behavior with a feedback.

MR. JACKSON: I think we answered one question, and then I'll try to answer this one slightly differently. So I agree with you where the uncertainty is.

Where I know uncertainty is where you get the oscillatory behavior, so I don't think there's a whole lot of uncertainty as to where they start. So I think we're pretty firm in that our methods, GE's methods that those are, that's based on the feedwater system and the feedback times there.

So I think that that's not where I have uncertainty. Where we have uncertainty is when you're trying to predict the oscillatory behavior. So what we

have is, at 90 seconds we have a result and we're confident that if you believe the GE model and it's, you know, it could be a great model, we just haven't reviewed it yet.

They showed several results even once you get to the oscillatory behavior. The onset, I don't think that's where the uncertainty is. I'm confident that you'll have, you know, if you can get those things in place 90 seconds, you're in good shape.

GE's got a calculation, so even if you don't get it in place in 90 seconds and you wait until 120 seconds and the oscillations start you could still be okay.

We might, after further review, end up agreeing with that, but what we're basing our decision on was that onset and I don't think there's a whole lot of uncertainty there.

MR. YARSKY: Yes. This is Peter Yarsky from the Office of Research. To clarify my earlier response, this 20-second period has more to do with I would say the immaturity in our analyses methodology and more so than uncertainty in the thermal hydraulic conditions that would result in the onset of instability. It's something that is better known than the 20 seconds

that I quoted earlier.

MALE PARTICIPANT: So the maturity, as you --

MEMBER BANERJEE: I think your number was good enough and you don't need to --

(Laughter)

MEMBER BALLINGER: As you mature, you have matured by the way. Will you get more margin do you think?

MR. YARSKY: Well where we are in the use of TRACE to do these kinds of calculations is, like we have a very large body of assessment against stability experiments.

MEMBER BALLINGER: Okay.

MR. YARSKY: And, you know, and when we do a time domain stability calculation we perturb it ourselves, our officially, and then we observe how that perturbation, it pays to evaluate things like stability margin.

Instability is a little different. With instability you're watching a plant evolve from a stable to condition to an unstable condition and then we gauge that it's unstable because we see growing oscillations.

Something that TRACE is susceptible to and

this is not necessarily the case in all time domain codes, just the one that TRACE is susceptible to, is predicting a condition where thermal hydraulically the reactor would be unstable, but not predict the onset of growing power oscillations because it's a computational framework.

So it can be sitting in something that is disguising an unstable condition. And when I say like it's because of methodology and maturity is that we're exploring the use of, just wiggling a little bit every now and again so that if it is unstable we give it just the right kind of wiggle so if it's something that is unstable, we jostle it enough to go into this growing power oscillation condition.

It's really a computational thing that I think is unique to TRACE and when you look at a TRACE result today I would say that there's some uncertainty in onset timing on this order of 20 seconds. So that's, I think it still could be construed in that particular context.

CHAIRMAN REMPE: Kord?

MEMBER CORRADINI: Can I --

CHAIRMAN REMPE: You already had your turn. Go ahead.

MEMBER CORRADINI: The Chair will shut me down, but time domain codes for instabilities always have a problem, and whether it be without power feedback or not.

But what I thought I was feeling comfortable with, but I listened to your discussion now and I'm not sure I completely got it, was that if I can come into a situation where I've got the initial and bounding conditions nailed down, then I should be able to see the evolution of the instability eventually portray itself and the time shift of that shouldn't be a big issue because, it just shouldn't be a big issue, but the way you just explained it makes me now wonder if I should retract that.

Because you were saying that there are certain things about TRACE that the methodology of just a solution may give you uncertainty? I don't follow completely, I'm sorry.

MR. YARSKY: Yes. Let me try it once more. What we're evaluating is a very slowly evolving transient, so things are happening relatively slowly when you compare it to something like a TRACE time step size.

Like we're looking at instability starting

say a minute plus into an event which could be with step sizes of like ten milliseconds of them, large number of time steps where between a few of them things are not changing very substantially.

So you may evolve into a condition where the reactor goes form a decay ratio of say 0.99 to 1.0 to 1.01, and at that point in time the reactor has become unstable.

MEMBER CORRADINI: And it may not see it?

MR. YARSKY: But we may not see it in our transient calculation result because you may be in a condition where if you have a perturbation it would grow, but you're doing a numerical calculation so that perturbation might not be there at that particular time step to then grow.

MEMBER CORRADINI: Okay. But you're taking, if I might just repeat it to you, but you're taking hundreds of time steps, thousands of time steps in 20 seconds.

So I would expect this thing would pop up and the wiggle room is not 20 seconds, but just seconds, fractions of a second. But am I missing something?

MR. YARSKY: Yes, like our intuition about it was that it would be on the order of about a period according to the natural frequency.

MEMBER CORRADINI: Okay.

MR. YARSKY: But it's something that we are currently looking into and this number that I have is just very preliminary and, you know, as we're trying to develop a generically applicable methodology to make sure that we have robustness and reproducibility.

That's not going past that NRR has charged us with.

MEMBER CORRADINI: And then you said --

(Simultaneous speaking.)

MR. YARSKY: I'm giving you the umber limit number as we best understand it today.

MEMBER CORRADINI: I'm better now. I'm not as confused about this. So is it just TRACE? The way you framed it is, you said just TRACE, but again I'm back to time domain codes generally have this problem.

MR. YARSKY: Right. I think it's something that has to be addressed by your methodology. So all codes might have this problem, but depending on how you use your code --

MEMBER CORRADINI: Okay, fine. Yes.

MR. YARSKY: -- right, and how mature your methodology is though you'll have a different resolution. And what we're exploring right now is the

use of what we call noise, but we need to study it more thoroughly to make sure that we're using it without perturbing our actual results, you know, and things like that. So, I mean --

MEMBER CORRADINI: But, I mean, just to turn back to the applicant who's hopefully not worried about our discussion --

(Laughter)

(Simultaneous speaking.)

MEMBER CORRADINI: Well don't they have characteristic noise in their machine that one could use a surrogate to see? I mean that sort of noise is fundamentally generated in the BWR anyway, whether it be flow or a void or --

MR. YARSKY: Oh, yes.

MEMBER CORRADINI: So isn't that what you use as the takeoff point for your initialization?

MEMBER BANERJEE: You're in ATWS?

MR. YARSKY: Yes, but if you have suddenly different --

MEMBER CORRADINI: No, no, no, during its normal, during normal, but when the BWR is running I'm sure it's a relatively noise machine.

MALE PARTICIPANT: You're not operating at

these conditions.

MALE PARTICIPANT: Huh?

MALE PARTICIPANT: You're not operating at these conditions in ATWS.

MR. YARSKY: Well you would still experience real life noise, so noise isn't --

MEMBER CORRADINI: But if we were able to take that real live noise and stick it in this condition at least to --

MEMBER BANERJEE: No. What you would do normally is you'd do a linear stability analysis and get the most unstable wave number and then perturb your solution with an area of wave numbers.

And they don't want to do that so they're taking sort of a bunch of wave numbers and simulating it, that's what I think anyway.

MR. SMITH: Maybe I'll comment on that.

CHAIRMAN REMPE: Okay, so --

(Simultaneous speaking.)

CHAIRMAN REMPE: Let's let him and Steve have a chance at, you know, giving their comments, okay.

MEMBER BANERJEE: Right.

CHAIRMAN REMPE: Go for it.

MR. SMITH: So I just spent 20 years trying

to predict the magnitudes and the time of these onsets because I was a believer that these things can all be computed, and the more I compute the less I believe is they're very, very hard, they're sensitive throughout the thing, so I applaud you for having an engineering solution to make sure you don't have to sharpen the pencil on the calculations too much.

So I believe the calculations are very realistic. I worry about the onset time and I would just suggest going through, and like you're saying, linear stability analysis.

You can do this similar thing if you go through a range of feedwater temperatures and water levels in the downcomer, so you, in effect, put a pseudo study state condition, 217, to look for the instability and then how you do the perturbation is kind of irrelevant.

Like if sometimes when you do these long simulations, and we saw this with the Oskarshamn instability event, that it was so long to get to the instability that people were all over the map of when it happened.

So here you're not that far out in time and as long as, as you're getting the instability, if you got

this at 250 seconds, another one will say well let's use 200 for operator training, I'd be very worried.

So it's important that that timeframe be short enough and then you've cut something off. So I would just recommend doing that, the linearized event, if you will, across the things that really drive it and make sure that's the shortest time that you have ever seen when you change the model.

Because a lot of them aren't certain and there's a lot pluses and minuses all the way going out.

MEMBER BANERJEE: Yes. I guess the problem, Kord, is right now in the absent, I don't know, if they may have done a linear stability or not.

So when you absence of a linear stability analysis, which may or may not be possible to do, you know, but GE has some results which show the onset is around 120 seconds. There's some uncertainty on that.

What are we going to, are we going to say there's enough margin on the 90 seconds, that really seemed to the issue, you know. Now if you feel that the uncertainty is too large that's a different matter, you know, but you have much more experience with this than anybody else.

MR. SMITH: I mean there's a lot common

things in the methods that worries me. We're all doing first order time integration for the most part, you know, you can takes lots of time steps but if it's a first order time integration you haven't changed the global behavior or your ability to predict the global behavior.

So that's a thing to watch out for. I haven't see a de-catastrophic and I suspect these results are quite believable. But once you get into these big oscillations, the magnitudally oscillations are very, very hard to predict.

So if we're going to believe, you know, our quench model or whatever is going to save us during this, I'd be very nervous for sure.

MR. VEDOVI: This is Juswald Vedovi, GEH, just want to, would like to add something about that and also respond to the comment of Dr. Corradini. I think one distinction when we talk about like Oskarshamn benchmark with respect toward, we talked, that is not in ATWSI.

So if we're talking about a transient analysis such as the Nine Mile instability event, the LaSalle instability event, and the Oskarshamn instability event, Leibstadt, Confrentes and so forth, all these stability events are transient and they're not

the ATWSI event that you are trying to discuss in this situation.

So that's one aspect. The other one is that Dr. Corradini mentioned about if there were qualification cases done for oscillations, and the answer is yes. Actually we have a quite extensive qualification benchmark of TRACG codes with actual plan data.

And notably the Peach Bottom stability test, Nine Mile trip, LaSalle, Leibstadt, and others. So these are documented in the Term G Qualification LTR which, of course, is available for the staff.

So in addition to that we do perform the oscillation test for each time that we develop a new fuel design and we compare that with TRACG analysis and we have very good predictions of the oscillations. Thanks.

CHAIRMAN REMPE: Any more comments?

MR. SMITH: Well I agree that a lot of the data that we have, really instability events that should have never happened because they get in a really bad control rod position power shape. They were totally avoidable.

So they're actually not very good for benchmarking this kind of thing other than can we do the,

that's the way oscillation predictions, you know, the physics of it directly.

One reason I like Oskarshamn is, in this context is, it was driven by a feedwater transient that happened over a long period of time and this plant was never in a stable condition and you weren't just looking at noise data to determine what decay ratios were.

You actually had to really understand data.

CHAIRMAN REMPE: Okay, Steve?

MEMBER SCHULTZ: Well we've covered a lot of ground since the applicant's presentation this morning.

(Laughter)

MEMBER SCHULTZ: And I think it's important that we did, but given the presentation that was made and the staff's reviews and the analysis results that we have seen for Monticello. Under the current fuel design and reload conditions I think a strong case has been made to support the implementation of MELLLA+.

With the proviso, of course, of the conditions and limitations that the staff has applied. For applications of any other analyses for other facilities that may have a higher power density, more stability, sensitivity, I think what we've seen today

demonstrated that those cases still need to be made.

And the same would be true, I would think, for alternative fuel designs or for mixed cores as well, but that's not what we're discussing with regard to Monticello at this point in time.

As we went into that discussion we had, in closed session, discussions related to credit for analytical improvements that might be made, provide more margin, to be honest I was unconvinced with the suggestions that were made there and we're out of closed session so we won't get into the details, but I think those evaluations and analyses need to be approached with great care.

The research work that was presented I think is very important to demonstrate and improve our understanding here and we've seen that today and I really did appreciate the quality of the work that has been done in the presentations that were made today because of what we can see as perhaps more challenging applications than from Monticello.

Coming back then to the last point with respect to Monticello, we have seen the importance of operator action and the timing associated with that and wanted to just re-emphasize one more time that the

applicant and the staff also needs to assure that as you come to the full committee with a case of operator action, that a real solid case must be made to support the time critical operator actions and the NUREG that we referred to earlier is associated with a formal analysis of human performance.

And that is, there is an expectation that at least that will be examined and the context of the operator action times will need to be put into that framework.

CHAIRMAN REMPE: So I, again, like to thank the licensee and the staff, as well as GE for their efforts to support this meeting and I think that they've provided some very useful insights i.e, speak, you know, I'm not sure right now we don't have the February full committee agenda, but usually an hour and a half might be a reasonable, to two hours max if it's a loose agenda that you'll have.

And so I share what Steve had said that the presentations should really focus on making a very strong case because you've only got a subset of a full committee here and there will be individuals who will be questioning you about the operator action time and you need to have a strong case to bat.

Uncertainties, where you might have more margin in the actual timing and the analysis would be very good to be prepared to answer questions about to provide further confidence that this is a strong case.

I think that the staff and the licensee have done a very thorough job of trying to support this in the documentation you've provided, and the staff's review, and the questions that were asked, and the responses back, but you won't have time, and the full committee members won't have read, most likely, all of that material, so just some advice on how we go forward.

And I appreciate everybody's willingness to stay till almost 6:00, I know we're way behind schedule. And if there aren't any further comments or questions I'm going to close the session, okay.

(Whereupon, the open meeting in the above-entitled matter went off the record at 5:50 p.m.)

U.S.NRC
UNITED STATES NUCLEAR REGULATORY COMMISSION
Protecting People and the Environment

ACRS Subcommittee on Power Uprates

Monticello Nuclear Generating Plant

Maximum Extended Load Line Limit Analysis Plus (MELLLA+)

December 3, 2013

U.S.NRC
UNITED STATES NUCLEAR REGULATORY COMMISSION
Protecting People and the Environment

Opening Remarks

John Monninger

Deputy Director
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

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Protecting People and the Environment

Introduction

Terry Beltz

Senior Project Manager
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

U.S.NRC
UNITED STATES NUCLEAR REGULATORY COMMISSION
Protecting People and the Environment

Review Timeline

- November 5, 2008 – EPU application submitted to NRC
- November 23, 2009 – NRC staff approve linking of the EPU and MELLLA+ LAR reviews
- January 21, 2010 – MELLLA+ application submitted to NRC
- March 15, 2010 – MELLLA+ application accepted for review
- October 2009 – Reviews placed on hold to resolve issues regarding application of CAP credit
- March 2011 – Reviews were reactivated. NSPM committed to resolving the CAP issue in the same manner as the EPU, such that the analysis of CAP assumed EPU and MELLLA+ conditions.

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Background on Review and Correspondence

- Application and supplements – 7
- Response to NRC staff requests for additional information – 8
- Audit report and presentation material associated with NRC staff audit of GE Hitachi

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Agenda

- MNGP MELLLA+ Overview
- Nuclear Design and Safety Analysis
- Training and Simulator
- MELLLA+ Testing
- Safety Analysis
- TRACE Confirmatory Analysis

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Questions

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Public Comments

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Committee Comments

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Adjourn

Monticello Nuclear Generating Plant
Maximum Extended Load Line Limit Analysis Plus

Advisory Committee on Reactor Safeguards

Power Uprate Subcommittee Meeting

December 3, 2013

Monticello Nuclear Generating Plant

Maximum Extended Load Line Limit Analysis Plus (MELLLA+)

Introduction

Mark Schimmel
Vice President Xcel Energy

NSPM ACRS Subcommittee Presenters

- Mark Schimmel – Vice President Xcel Energy
- John Grubb – Technical Assistant to the Monticello Site Vice President
- Steve Hammer – Monticello Engineering - MELLLA+ Project Manager
- Rick Stadtlander – Monticello Assistant Operations Manager

Background

Monticello Nuclear Generating Plant Overview

Operating License issued on September 8, 1970

Commercial Operation commenced on June 30, 1971

Full Term Operating License was issued on January 9, 1981

GE BWR 3 - Mark I Containment

OLTP Limit	1670 MWt
Initial Plant Rerate Implemented in 1998 (CLTP)	1775 MWt
20% OLTP (12.9% CLTP) EPU Planned for 2013	2004 MWt

Implementation of MELLLA+ allows the plant to achieve full EPU power conditions

Monticello MELLLA+ Overview

MELLLA+ Basis

NSPM Implementation of MELLLA+

Relationship to EPU

MELLLA+ Basis

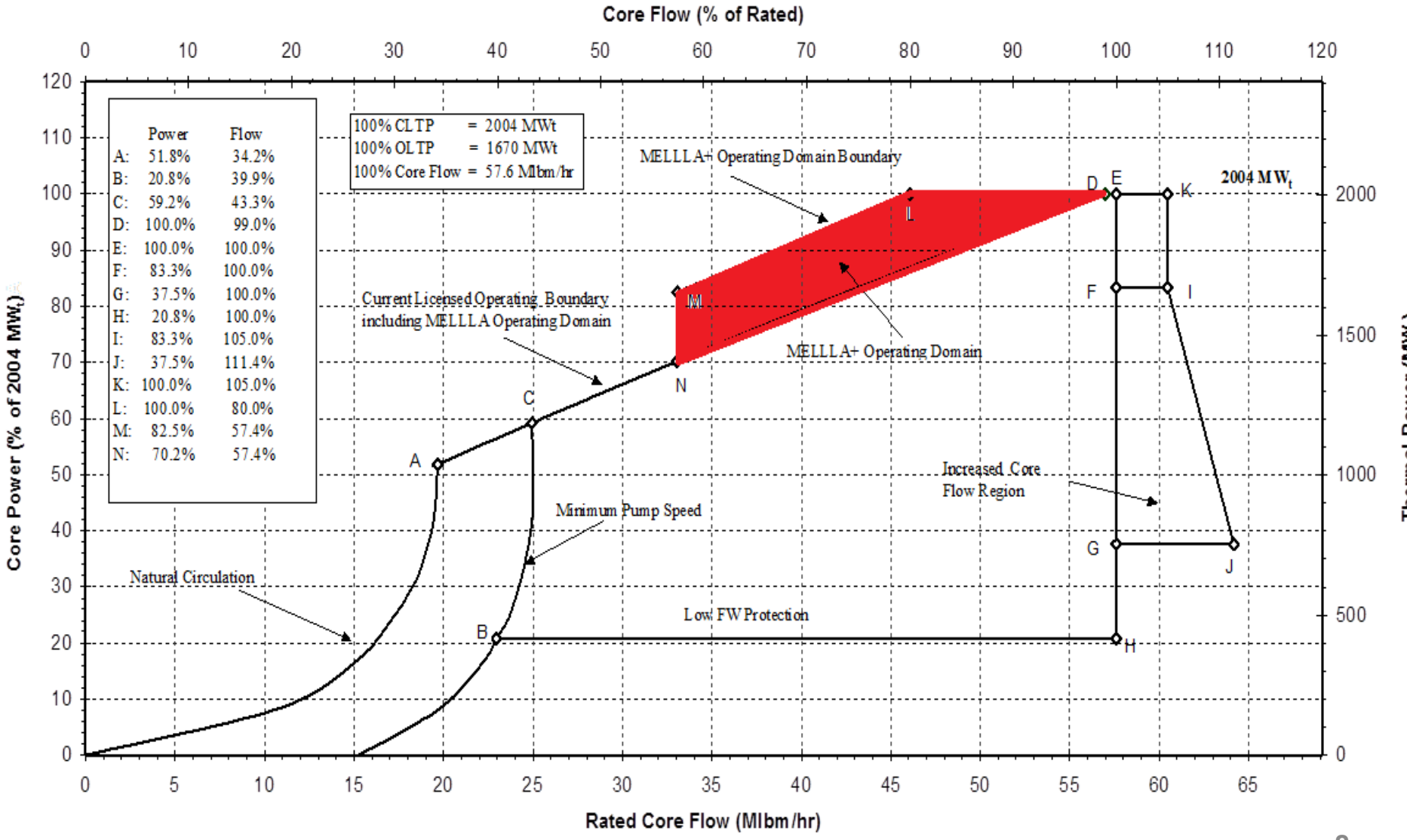
MELLLA+ Basis:

- MELLLA+ M+SAR (NEDC-33435P) provides analysis for MELLLA+ implementation
- Only previously NRC-approved or industry-accepted methods were used for the analyses of accidents and transients

MELLLA+ Basis

- MELLLA+ application based on GEH MELLLA+ Licensing Topical Reports
  - NEDC-33006P-A - General Electric Boiling Water Reactor Maximum Extended Load Line Limit Analysis Plus (M+LTR)
  - NEDC-33075P-A - General Electric Boiling Water Reactor Detect and Suppress Solution – Confirmation Density (DSS-CD LTR)
  - NEDC-33004P-A - Constant Pressure Power Uprate (CLTR)
  - NEDC-33173P-A - Applicability of GE Methods to Expanded Operating Domains (IMLTR)
  - NEDE-33147P-A - DSS-CD TRACG Application (DSS-CD TRACG LTR)

NSPM Implementation of MELLLA+



NSPM Implementation of MELLLA+

Changes Based on MELLLA+:

- MELLLA+ operating domain expansion is an incremental expansion of the operating boundary at EPU conditions, EPU is considered CLTP
- MELLLA+ changes the operating power/core flow map and changes a number of instrument and alarm setpoints
- MELLLA+ Core flow is analyzed as low as 80% of rated core flow under EPU conditions
- Technical Specification Changes to implement DSS-CD Long Term Stability Solution

NSPM Implementation of MELLLA+

MELLLA+ Does Not Change:

- Maximum licensed power
- Maximum licensed core flow
- Maximum licensed plant vessel dome pressure
- Balance of Plant Equipment
- No major hardware changes required to support MELLLA+

MELLLA+ Relationship to EPU

- **MNGP constrained at full EPU conditions by power/flow map without MELLLA+**
- **MELLLA+ assumes EPU conditions**
- **MELLLA+ system parameters are bounded by EPU conditions**
  - MS and FW temperatures, flows, and pressures
  - Reactor Recirculation and CRD system temperatures, flows, and pressures
  - SRVDL temperatures, flows, and pressures
  - RWCU system temperatures, flows, and pressures
  - RCIC, HPCI, CS, RHR and SLCS system temperatures, flows, and pressures