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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

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POWER UPDATES SUBCOMMITTEE

OPEN SESSION

+ + + + +

MONDAY

JUNE 22, 2015

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ROCKVILLE, MARYLAND

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The Subcommittee met at the Nuclear Regulatory Commission, Two White Flint North, Room T2B1, 11545 Rockville Pike, at 8:30 a.m., Joy Rempe, Subcommittee Chairman, presiding.

COMMITTEE MEMBERS:

- JOY REMPE, Chairman
- RONALD G. BALLINGER, Member
- MICHAEL L. CORRADINI, Member
- DANA A. POWERS, Member
- STEPHEN P. SCHULTZ, Member
- GORDON R. SKILLMAN, Member

1 ACRS CONSULTANT:

2 KORD SMITH

3

4 DESIGNATED FEDERAL OFFICIAL:

5 ZENA ABDULLAHI

6

7 ALSO PRESENT:

8 DAN CIFONELLI, Exelon

9 BOB CLOSE, Exelon

10 DALE GOODNEY, Exelon

11 GEORGE INCH, Exelon

12 MOHAMED KHAN, Exelon

13 JOSE MARCH-LEUBA, Oak Ridge National Laboratory

14 DIEGO SAENZ, NRR

15 TRAVIS TATE, NRR

16 GEORGE THOMAS, NRR

17 BHALCHANDRA VAIDYA, NRR

18 JUSWALD VEDOVI, GE Hitachi

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Subcommittee Chair Opening Remarks

Dr. Joy Rempe . . . . . 4

Staff Opening Remarks

NRR Management Travis Tate . . . . . 5

Introduction

NRR Project Manager Bhalchandra Vaidya . . . . . 8

NMPT MELLLA+ Overview, Exelon

Mohamed Khan . . . . . 21

Dale Gooney . . . . . 28

George Inch . . . . . 24

Dan Cifonelli . . . . . 81

Training and Simulator . . . . . 104

Open Pubic Comments . . . . . 107

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

9:32 a.m.

CHAIR REMPE: This meeting will now come to order. This is a meeting of the Power Upgrades Subcommittee of the Advisory Committee on Reactor Safeguards.

I am Joy Rempe and I am chair of the subcommittee. ACRS members in attendance include Stephen Schultz, Dick Skillman, Dana Powers, Ron Ballinger and Michael Corradini, and we also have our consultant, Professor Kord Smith.

Zena Abdullahi is the designated federal official for this meeting. In today's meeting the subcommittee will review the Nine Mile Point Unit 2 license amendment request to allow power operation in the expanded Maximum Extended Load Life Limit Analysis Plus, or MELLLA+ domain.

We'll hear presentations from the NRC staff and representatives from the licensee, Exelon. Part of the presentations by the licensee and the NRC staff will be closed in order to discuss information that's proprietary to the licensed unit's contractors pursuant to 5 USC 552b(c)4.

Attendance at these portions of the meeting that deals with such information be limited to

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1 the NRC staff, Exelon and those individuals and  
2 organizations who have entered into appropriate  
3 confidentiality agreements with them.

4 At the end of the open part of this  
5 meeting we'll have -- we have scheduled a public  
6 comment period and prior to the start of the closed  
7 portion of this meeting we request that Exelon's staff  
8 and their consultants survey the attendees in the room  
9 to ensure that all participants are cleared for access  
10 to their proprietary information.

11 A transcript of the meeting is being kept  
12 and will be made available, as stated in the Federal  
13 Register notice.

14 Therefore, we request that participants in  
15 this meeting use the microphones located throughout  
16 the meeting room when addressing the subcommittee.

17 The participants should first identify  
18 themselves and speak with sufficient clarity and  
19 volume so that they may be readily heard.

20 We will now proceed with the meeting and  
21 I'll call upon Travis Tate of NNR management to begin.  
22 Travis?

23 MR. TATE: Good morning. I am Travis  
24 Tate, currently acting deputy director in the Division  
25 of Operator Reactor Licensing in NRR.

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1           The staff is pleased to have this  
2 opportunity to provide you an overview of the Maximum  
3 Extended Load Line Limit Analysis Plus, or MELLLA+,  
4 license amendment application for the Nine Mile Point  
5 Nuclear Station Unit 2.

6           The staff will also describe its review of  
7 the Nine Mile Point Unit 2 transient and accident  
8 analysis for MELLLA+.

9           This LAR is the NRC staff's third review  
10 involving the implementation of the MELLLA+ with  
11 Monticello and Grand Gulf being the other two.

12           In all three cases, the licensees used  
13 NRC-approved GEH MELLLA+ licensing topical report. As  
14 the staff concluded for Monticello and Grand Gulf, the  
15 NRC staff has determined that operation of the MELLLA+  
16 -- domain in the MELLLA+ domain at Nine Mile Plant 2  
17 provides additional operational flexibility while not  
18 compromising plant safety.

19           The NRC's technical staff's presentation  
20 today will include a comparison of the significant  
21 differences between the prior MELLLA+ license  
22 amendment reviews and the Nine Mile Point Unit 2  
23 review.

24           In addition, I would like to note that we  
25 currently have one additional MELLLA+ application in

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1 house and that is for the Peach Bottom site.

2 The Peach Bottom application is currently  
3 under review and will be scheduled in the near term  
4 for the ACRS subcommittee and full committee reviews.

5 I would also like to highlight -- I know  
6 there's been some questions on a few open items that  
7 we still have in the staff SE. We plan to address  
8 that if it's okay with the committee during the  
9 session this afternoon during -- on open items.

10 CHAIR REMPE: Actually, Travis, if you  
11 don't mind because of the open items I would like to  
12 discuss them now a little bit --

13 MR. TATE: Okay.

14 CHAIR REMPE: -- to understand the  
15 schedule and there's a couple of items that I have  
16 that I wanted to bring up that are more process  
17 related.

18 MR. TATE: Okay.

19 CHAIR REMPE: Is this is a good time? Are  
20 you finished --

21 MR. TATE: Yeah.

22 CHAIR REMPE: -- with your opening  
23 remarks?

24 MR. TATE: Yeah, I'm pretty much finished.

25 CHAIR REMPE: Okay. So as you noted, in

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1 the draft SE that the staff provided there are several  
2 places where it refers that you need to get feedback  
3 back from certain other branches -- the staff?

4 MR. TATE: Yes.

5 CHAIR REMPE: What is going on? What's  
6 the status? Have you received that input?

7 Because the concern is that we cannot go  
8 to a full committee briefing in July if those -- if  
9 the ACRS does not have a draft SE that doesn't -- that  
10 does indicate that the staff has fully completed its  
11 review.

12 MR. TATE: Yes. In my understanding of  
13 that, and Bhalchandra can correct me --

14 MR. BHALCHANDRA: Okay. Since I was  
15 involved in assembling the SE -- sorry.

16 MEMBER CORRADINI: You need a green. It  
17 needs to turn green.

18 MR. BHALCHANDRA: Yeah, it is there now,  
19 right? Okay. I thought it was. I had identified  
20 about five items in the draft SE and I already have a  
21 staff resolution on one item that deals with providing  
22 the safety evaluation.

23 And if everybody remembers it is related  
24 that to REI-14 in Appendix A and we have received it  
25 so it's a question of assimilating it into the total

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1 draft.

2 So I'm pretty confident that I'll be able  
3 to incorporate it in the SE within the time frame --  
4 in a short time frame.

5 The other items are, like you had  
6 mentioned, basically confirmation from technical  
7 branches that what is in the text is correct and  
8 therefore I do not expect any major change in the text  
9 that appears right now in the -- in the draft SE.

10 The only thing I will do after  
11 confirmation is remove the notation that says hold for  
12 confirmation.

13 CHAIR REMPE: Okay. We've gotten the May  
14 26th version and even the June 1st and this June 2nd  
15 version and that's lines are still there.

16 My concern is we cannot -- and actually I  
17 discussed this with the chairman of the ACRS -- we  
18 cannot have this full committee discussion if we don't  
19 have an official version that's transmitted to ACRS  
20 before the full committee meeting.

21 And, you know, there's the issue about  
22 putting it on the Federal Register. The licensee has  
23 made plans to show up in July.

24 If we don't have it in July it will go to  
25 September even -- and we're not even sure we can get

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1 it in to the full committee meeting in September,  
2 which will probably start making the licensee very  
3 unhappy.

4 So I need to know when will we get a copy  
5 that's official to the ACRS so that we can make this  
6 decision about whether to plan for the meeting or not.

7 MR. TATE: Yeah. I think our goal is to  
8 try to get that finished this week and have that  
9 wrapped up with the safety evaluation completed this  
10 week. I don't --

11 MR. BHALCHANDRA: That's what I was going  
12 to mention that I'm pretty confident that because I  
13 have a big item related to REI 14 evaluation already  
14 from staff it will not be too much -- it will not take  
15 too much time to incorporate it in the SE and close  
16 the other items also which are basically confirmation  
17 of what is there in the SE already.

18 So I feel pretty confident that before the  
19 end of the week I should be able to send you the --  
20 resend you the SE by removing the items.

21 CHAIR REMPE: Pretty confident, and by the  
22 end of the week is a little too vague. Could we have  
23 something that's very succinct? During the day to  
24 day, can I ask you, Travis --

25 MR. TATE: Absolutely.

1 CHAIR REMPE: -- to make contact or --

2 MR. BHALCHANDRA: With the branches.

3 CHAIR REMPE: Yes, with the other  
4 branches. Ask them when they're going to have it and  
5 then give me -- I don't know if it takes a day to turn  
6 around another version but I --

7 MR. TATE: Right.

8 CHAIR REMPE: -- need some details that  
9 everyone has confidence in that it will be done.

10 MR. TATE: Right. Yeah.

11 CHAIR REMPE: So it's time to bring this  
12 up and make sure we get that.

13 MR. TATE: I will make sure I go back and  
14 make sure that we have everything lined up to give you  
15 a firm date this week when we'll have the SE back to  
16 you completed. Absolutely.

17 CHAIR REMPE: Okay, because the chairman  
18 will not let this go on much longer here.

19 MR. TATE: Right.

20 CHAIR REMPE: So we need to have that  
21 figured out, okay.

22 MEMBER CORRADING: I had a question that  
23 was more about process but a bit more technical in the  
24 sense that you identified that Peach Bottom is the  
25 next one and there's no other -- there's no other

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1 potential ones sitting in front of the staff at this  
2 point?

3 MR. TATE: Not that I'm aware of.

4 MR. BHALCHANDRA: I'm not aware of any  
5 other one.

6 CHAIR REMPE: What about Browns Ferry?

7 MR. BHALCHANDRA: I don't think their  
8 application has come in yet.

9 MEMBER CORRADINI: And so if I might  
10 broaden my question, and so given that there's three  
11 and you're expecting four, my question is has the  
12 staff looked at this in terms of technical issues that  
13 have arisen because of the discussion here or within  
14 staff that from a lessons learned standpoint there are  
15 certain things that are becoming generic that you  
16 should look at more deeply with any potential upcoming  
17 applications?

18 Or is everyone so different because of  
19 equipment and set points and operator actions that  
20 there really can be nothing but a case by case  
21 evaluation?

22 I'm kind of curious about that because  
23 we've gone through two. This is the third which, in  
24 theory, I understand. But they all seem to -- there  
25 are a few things that are -- in my mind that are

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1 popping out.

2 I'm kind of curious what the staff sees  
3 relative to generic things that they should look at if  
4 these continue.

5 MR. TATE: Someone from the technical  
6 staff -- could you answer that question?

7 MR. THOMAS: Yeah, this is George Thomas  
8 from Reactor Systems. I'm here for Chris Jackson.  
9 Basically, we wanted to look at least two or three of  
10 them.

11 Now we are seeing most of them --- BWR 4,  
12 BWR 5 Mark 2 manual stable delivery control system,  
13 automatic stability control system so now we come to  
14 a point, you know, I think there is not much --- you  
15 know it seems spending too much time on this because  
16 we already see now three, four of them.

17 Monticello we are seeing, there on Gulf,  
18 now Nine Mile, each one. So, you know, we don't see  
19 much using -- going through this line again and again.

20 MEMBER CORRADINI: Well, the reason I  
21 asked my question the way I did is I might agree that  
22 if we'd gone into these three or four times and  
23 everything looks good that it becomes more -- I won't  
24 use the word routine but a little more -- there's more  
25 -- we're all -- we're all very familiar with it.

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1           But I'm curious if there is generic things  
2 that are popping up that staff needs to look into more  
3 deeply. And so is the answer to that no or maybe or  
4 come back -- you'll come back and tell us?

5           MR. THOMAS: We can come back and tell you  
6 but my personal opinion is that there is no using -

7           MEMBER CORRADINI: Okay.

8           MR. THOMAS: -- this again and again.  
9 Okay. You can go back to my recommend and then hear  
10 from --

11          MEMBER CORRADINI: Okay. But I -- but I  
12 do think as an action item for the subcommittee I  
13 think this would be useful because at least from my  
14 standpoint there are a couple things that seem to be  
15 coming up at least twice, maybe three times, that we  
16 at least should clear up so that if this continues  
17 with other applications we're well ahead of it and  
18 we're not dragging in the applicant or the licensee,  
19 I should say, or the staff asking the same set of  
20 questions again and again.

21          CHAIR REMPE: And I think those couple of  
22 items that come to mind will be emphasized again today  
23 and they've come up in the last couple. I think what  
24 he's getting to is obvious.

25          MR. BHALCHANDRA: Yeah, I was just going

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1 to mention when we were trying -- we were assembling  
2 the SE for Nine Mile Point 2 we made a concerted  
3 effort to incorporate what was happening during the  
4 subcommittee hearings for Grand Gulf and tried to  
5 improve on the SE to hopefully to have all the same  
6 questions coming from subcommittee for Nine Mile. I  
7 hope it has worked. You will tell us pretty soon.

8 CHAIR REMPE: There's another question I'd  
9 like to bring up that's a bit different with this one  
10 that I didn't see with Grand Gulf and Monticello and  
11 that's related to this recommended areas for  
12 inspections in Section 4.4 of your draft SE.

13 In particular, I'm a little bit perplexed  
14 about the phrase full implementation in MELLLA+ with  
15 only partial testing will not be acceptable and that  
16 implementation of the MELLLA+ will be limited only to  
17 the region where testing has performed or has been  
18 performed.

19 What exactly -- I mean, we can wait and  
20 talk about this more in the closed session but this is  
21 something that was a little perplexing because there  
22 is a certain region that's associated with this  
23 application and are you planning to not -- the testing  
24 to not grant them the full access to that in the  
25 region?

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1 MR. BHALCHANDRA: Actually, some of the  
2 technical staff is ready to cover that point. But if  
3 you want to cover it right now then --

4 CHAIR REMPE: We can wait. But I just  
5 wanted to give you heads up because that was a little  
6 bit different and I didn't see that before.

7 MR. BHALCHANDRA: Yes. We are aware of  
8 that and -- we are aware of that and they're going to  
9 cover it in their presentation.

10 CHAIR REMPE: Okay. So with that, I'll  
11 turn -- let you do whatever you want to do next here.

12 MR. TATE: Okay. No, I was done and at  
13 this point I just want to thank you for your time  
14 today and like to turn the meeting over to Bhalchandra  
15 Vaidya, who's the project manager for Nine Mile Point  
16 2.

17 MR. BHALCHANDRA: Thank you. I'm trying  
18 to learn how to go to the next slide.

19 Hello, I am Bhalchandra Vaidya. I am the  
20 licensing project manager for Nine Mile Point 2  
21 MELLLA+ amendment.

22 I have provided a CD containing draft SE  
23 and all the licensee submission to ACRS. I'm sure you  
24 have looked at all that material.

25 I just want to go briefly go over the

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1 review time line and basic aspects of this amendment.  
2 Licensee submitted the application for license  
3 amendment on November 1, 2013 and we went through  
4 acceptance review and after licensee submitted some  
5 supplemental information on January 21 we accepted the  
6 application.

7 And in the original application of  
8 November 1, licensee had committed to provide some  
9 other information which was submitted on February 25.

10 Licensee submitted the revised application  
11 on June 13th, 2014 to reflect the completion of --  
12 complete implementation of changes related to standby  
13 liquid control system.

14 Licensee implemented the amendment  
15 regarding improvements to standby liquid control  
16 system during the spring 2014 outage and that is the  
17 reason -- basically the reason for revising the  
18 application because a number of things they had  
19 identified in November 1 were longer needed and that's  
20 how they -- that's why they revised it.

21 There was no change to the basic content  
22 of the application. After that I think we -- I'm sure  
23 we published the biweekly -- Federal Register notice  
24 regarding no significant hazard determination on June  
25 6th and August 5.

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1           June 6th was based on November 1  
2 application and August 5 was revised based on revised  
3 application. Staff during the review issued multiple  
4 rounds of requests for additional information -- RAIs  
5 -- on various topics such as reactor systems,  
6 instrumentation controls, human factors, et cetera and  
7 licensee provided their responses to REIs during the  
8 period of March 7, 2014 to February 18th, 2015.

9           Staff also conducted an audit at Nine Mile  
10 Point 2 site on November 20, 2014. Licensee's  
11 existing license condition and proposed numerous  
12 technical specification changes support MELLLA+  
13 application.

14           There are -- Existing License Condition 7  
15 restricts free water heater out of service by imposing  
16 a 20 degrees Fahrenheit free water temperature ban and  
17 out of numerous technical specification changes I will  
18 just mention a few of them.

19           The proposed fee has changed for TS LCO,  
20 which is limiting condition of operation 3.4.1,  
21 prohibits single loop operation in MELLLA+ expanded  
22 domain.

23           Some other changes are revised safety  
24 limit in TS 2.1.1.2 by increasing the SLM CPR value  
25 for two recirculation loops in operation from greater

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1 than 1.07 to greater than 1.09.

2 Another one is revise the acceptance  
3 criteria in TS 1.7.7, which is standby liquid control  
4 system surveillance requirement by increasing the  
5 discharge pressure value from greater than 1,327  
6 pounds PSIG to greater than 1,335 PSIG.

7 There are a number of others but they are  
8 just too numerous to list here. That is why I have  
9 avoided that.

10 MEMBER SKILLMAN: Let me ask -- let me ask  
11 this question.

12 MR. BHALCHANDRA: Yeah.

13 MEMBER SKILLMAN: Let me ask this  
14 question, please. That is an 8 PSI out of 1,300. Why  
15 is that sufficient?

16 MR. BHALCHANDRA: I would probably request  
17 technical staff to see whether they can answer and  
18 provide a response to that.

19 MR. THOMAS: I didn't get a date for  
20 people from this for instrumentation and control --

21 MR. BHALCHANDRA: Oh, okay.

22 MEMBER CORRADINI: But we'll eventually  
23 get the answer, right?

24 MR. BHALCHANDRA: Yes. Make sure that  
25 during this -- no, and during their presentation they

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1 will provide the response.

2 CHAIR REMPE: Also, if I recall correctly  
3 the text that was related to the single loop operation  
4 it actually had some funny words about intentional  
5 operation and it prohibits intentional operation in  
6 single loop operation.

7 It has some fuzzy words in there and why  
8 were those fuzzy words added? I mean, is it  
9 prohibited or not? What is the -- are they going to  
10 say oops, I didn't meant to, sorry?

11 MR. THOMAS: I think it's prohibited.

12 CHAIR REMPE: It is prohibited but the  
13 actual words that are in the draft SE and I believe  
14 actually in the report it has something about  
15 intentional operation.

16 MR. THOMAS: Okay. But we can maybe  
17 change it.

18 MR. MARCH-LEUBA: This is Jose March-  
19 Leuba, Oak Ridge National Laboratory. This is a tech  
20 spec kind of language. If they lose the pump they  
21 will have to scam the wheel, they have to exit that  
22 condition within immediately between 12 hour. So if  
23 open the plant on a single pump they will be operating  
24 in a single rule.

25 CHAIR REMPE: Okay.

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1 MR. MARCH-LEUBA: But it will not be  
2 intentional.

3 CHAIR REMPE: Okay. Thank you.

4 MR. BHALCHANDRA: Well, I think my summary  
5 of the review part is complete and if you don't have  
6 any other questions for me I will turn it over to the  
7 licensee for their part of the presentation.

8 MR. KHAN: All right, good morning. My  
9 name is Mohamed Khan. I am the engineering manager at  
10 Nine Mile Point Nuclear Station.

11 I would like to thank the ACRS  
12 Subcommittee for this opportunity and the time to  
13 brief you on Exelon Nine Mile Point Nuclear Station  
14 Unit 2, operating license amendment request to allow  
15 the plant operation in a Maximum Extended Load Line  
16 Limit Analysis Plus the main level, plus on the  
17 previously approved extended power upgrade conditions.

18 This expanded region provides greater  
19 operational flexibility that would significantly  
20 reduce the need for frequent downpowers and for  
21 control rod panel adjustments, as well as a number of  
22 deep downpowers.

23 My technical team and operations staff  
24 from Nine Mile Point and representatives from Exelon  
25 Corporate Fuels and Regulatory Assurance, along with

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1 representatives from General Electric-Hitachi are here  
2 today to review with the subcommittee an overview of  
3 the project scope, modifications that have been  
4 previously implemented, testing of implementation  
5 activities that remain, and provide an overview of the  
6 procedure changes and the remaining training to  
7 support the implementation.

8 Here with me presenting is Dale Goodney to  
9 my left, Senior Project Manager, followed by George  
10 Inch, my Technical Senior Staff Engineer, and Dan  
11 Cifonelli, Licensed Unit II Operations Shift Manager.

12 All the licensee participants here today  
13 from Exelon Corporation includes Nuclear Fuels, and  
14 also Regulatory Assurance, and to the back,  
15 representatives from GE-H, General Electric-Hitachi.

16 Also on the conference line are technical  
17 support from the staff, from Nine Mile Point's  
18 technical team and also from GEH.

19 On the agenda today, I will be providing  
20 a station overview, followed by Dale Goodney, who is  
21 going to provide the project overview, followed by  
22 George Inch, who is going to discuss the design  
23 analysis section, and lastly, followed by Dan  
24 Cifonelli, who will provide an overview of the  
25 procedures and the training that remains.

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1           A brief overview of the station, Nine Mile  
2 Point Unit 2 is a General Electric BWR-5 and a Mark II  
3 Containment. It began commercial operation in 1988  
4 and is licensed until 2046. It is on a 24-month  
5 operating cycle with the core consisting of all GE 14  
6 fuel type.

7           We have three electric motor-driven  
8 feedwater pumps. Each pump is rated for 65 percent  
9 capacity. So, rated conditions to feed system is  
10 designed to operate with only two pumps in service.

11           We also have two reactor recirculation  
12 flow control valves loops. They are both constant  
13 speed pumps with flow regulated through the flow  
14 control valves.

15           The unit was licensed for initial core  
16 flow during plant startup between 100 to 105 percent  
17 core flow, which is our current operating region.

18           And last, designed feature is the  
19 Redundant Reactivity Control System, which includes  
20 two important automatic features important for ATWS,  
21 and that includes the Automatic Standby Liquid Control  
22 System and the automatic feedwater runback feature.

23           CHAIR REMPE: Excuse me.

24           MEMBER CORRADINI: Can I ask a question  
25 about that, if I might, since you brought up RRCS?

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1           So, in our limited time, sometimes that is  
2           there for automatic feedwater runback and sometimes it  
3           is not. Can somebody explain from a design standpoint  
4           why it is an optional thing or is it just  
5           evolutionary?

6           MR. INCH: I think I can start. I think  
7           there are four BWRs and GE can help me out here, that  
8           have a Redundant Reactivity Control System that  
9           includes an Automatic Standby Liquid Control System  
10          pump start and also feedwater runback.

11          There is a lot of plants that have  
12          Redundant Reactivity Control Systems that have open  
13          rod injection and recirc pump trip features. But the  
14          one at Nine Mile and I think there are three other  
15          plants, have additional features.

16          MEMBER CORRADINI: And from a design  
17          standpoint, is that something that is optional and  
18          somebody took the option or is it something about how  
19          the machine is designed that this fits into how it  
20          should operate?

21          MR. INCH: I think in that generation of  
22          design of the redundant reactivity control system that  
23          Nine Mile II was built to, I believe that was the  
24          offering from GE that plant selected to. But  
25          depending on what vintage the plant was, what era the

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1 licensing was, it was different.

2 GE, Craig or Bruce, could you elaborate?

3 DR. VEDOVI: This is Dr. Juswald Vedovi  
4 from GE-H. It was evolutionary. So, some plants  
5 happened to have the possibility to include these  
6 evolution in the design and some others did not.

7 MEMBER CORRADINI: Okay. And then since  
8 you are up, how complex is this option?

9 DR. VEDOVI: I'm sorry?

10 MEMBER CORRADINI: How complex is it in  
11 terms of is it a matter of control system logic or is  
12 it a matter of a whole different feedwater pumps? I'm  
13 trying to understand if I get into the details, is it  
14 --

15 MR. INCH: I can't speak in generic but we  
16 have electric feed pumps. So, for our design, the  
17 design has -- they have the digital logic coming out  
18 of the redundant reactivity control system, which then  
19 has an additional analogue system logic that controls  
20 the feedwater red valves and the bypass valves, in  
21 order to achieve that. And then for standby liquid  
22 control, it interfaces with that system.

23 So, it is not a simple design but it has  
24 complexity to it.

25 MEMBER CORRADINI: Okay, so I have two

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1 more questions and then you can hold me off since you  
2 are just in the interaction phase. But so the next  
3 question in my mind is okay, so it is digitally  
4 monitored and then analog actuated. So, I am curious  
5 about what that doesn't work and then the operators  
6 have to do something manually.

7 And the second part of it is, if this is  
8 such a good thing, why wasn't it retrofitted into  
9 other designs? Or because it is an electric-driven  
10 pump with a certain vintage or type versus a  
11 steam-driven, it can't be retrofitted. These sorts of  
12 details intrigue me, since this is our third shot at  
13 this and each one has been different.

14 MR. INCH: With regard to the 10 CFR 5062  
15 for the ATWS rule, it was not a requirement.

16 MEMBER CORRADINI: Okay.

17 MR. INCH: It was a feature that --

18 MEMBER CORRADINI: Was available.

19 MR. INCH: -- Niagara Mohawk elected to  
20 have is the best I understand. We can have that  
21 fact-checked.

22 MEMBER CORRADINI: Okay.

23 MR. INCH: But I believe that is how it  
24 came about.

25 MEMBER CORRADINI: And then -- well, okay.

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1 But then we can defer that. But I am also curious  
2 about, from a technical standpoint, if it fails and I  
3 don't get a digital control that says run back, how  
4 are the operators trained to observe that and react  
5 within some time window?

6 MR. INCH: I think Dan is in the position  
7 --

8 MEMBER CORRADINI: If we are going to get  
9 to that later, that's fine.

10 MR. INCH: We are going to get to that.

11 MEMBER CORRADINI: Okay, thank you.

12 CHAIR REMPE: Before you leave this slide,  
13 I have a simple question. What is the power density  
14 for this plant?

15 MR. INCH: At rated EPU power, which is  
16 3988, the power density is 58.99 kilowatts per liter.

17 CHAIR REMPE: Okay, thank you.

18 MEMBER CORRADINI: We are having an  
19 argument amongst us as to whether it is power or power  
20 overflow. So, that is just a continuing argument.  
21 So, you are not involved.

22 MR. INCH: We've got the numbers both  
23 ways.

24 CHAIR REMPE: And we will report it as  
25 such. Anyway, go ahead, please.

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1 MR. KHAN: Okay. So, a brief overview of  
2 Nine Mile Point Unit 2 history. We received our Full  
3 Power Operating License in 1987 for 3,323 megawatts  
4 thermal. We went to stretch power uprate in 1995,  
5 which took us to 104.3 percent OLTP and we implemented  
6 the Option III stability solution in the year 2000 and  
7 renewed our operating license in 2006 but will enter  
8 the renewed period starting in 2026.

9 We implemented the MELLLA operating  
10 domain, which allowed for core flow down to 80 percent  
11 in 2008 and lastly, we implemented the extended power  
12 uprate in July of 2012. Unit 2 is currently in its  
13 second operating cycle under EPU conditions.

14 At this time, if there are no further  
15 questions, I would like to turn it over to Dale  
16 Goodney.

17 MR. GOODNEY: Thank you, Mohamed and good  
18 morning. I'm Dale Goodney. I'm the Project Manager  
19 for the MELLLA+ project at Nine Mile Point.

20 This is a general project overview and I'm going  
21 to be covering MELLLA+ licensing, MELLLA+ benefits,  
22 the project scope, and I will be discussing our  
23 implementation plan.

24 The Nine Mile 2 MELLLA+ license amendment  
25 scope included the expanded operating domain and the

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1 DSS-CD stability solution, along with the associated  
2 tech spec changes.

3 The MELLLLA+ safety limit minimum critical  
4 power ratio tech spec change was also submitted with  
5 the initial MELLLLA+ license amendment request, as was  
6 mentioned earlier.

7 There are no other pending license changes  
8 related to MELLLLA+, either under review or to be  
9 submitted. There was, however, one other previous  
10 license amendment that was related to MELLLLA+. That  
11 was for the enriched boron. That was issued to Nine  
12 Mile 2 in March of 2014 and it was implemented in  
13 April 2014 during the reviewing outage.

14 CHAIR REMPE: Dale, you can answer this  
15 later but with the DSS-CD, there are some questions I  
16 have about the phrase power suppression trip signal  
17 and how it actually works. Does it give an alarm when  
18 it starts, when certain parameters are reached and  
19 that alarm is used by the operators to try and  
20 intervene before actually a trip signal is initiated?  
21 Is that the way this works?

22 Because that phrase, I was discussing it  
23 with another colleague that is a member on ACRS with  
24 respect to another plant. And they were curious about  
25 what that phrase meant because you said you thought

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1 that would confuse operators, the phrase power  
2 suppression trip signal.

3 MR. GOODNEY: Well, there are two levels.  
4 There is an alarm that comes in, based on a number of  
5 confirmation counts, along with the amplitude. That  
6 is set slightly lower than the actual trip signal.

7 How that works in terms of the actual  
8 thermal hydraulic parameters, you could maybe provide  
9 a little bit more, elaborate on that some more,  
10 Juswald.

11 DR. VEDOVI: Yes, this is Dr. Juswald  
12 Vedovi from GE-H. Specifically, are you interested in  
13 how the alarms is triggered?

14 MEMBER CORRADINI: I think she is asking  
15 what confuses me, which is is that just to tell the  
16 operator, uh-oh, something is about to happen, or is  
17 there an action that is to be initiated?

18 CHAIR REMPE: Well, not only does it give  
19 the operators uh-oh, something is about to happen,  
20 they actually have that chance to intervene before the  
21 trip is initiated is my understanding.

22 And again, this is a colleague who is not  
23 here today. We were discussing and he said well, he  
24 thought it was just a trip and so we wondered.

25 DR. VEDOVI: Yes, the main function of the

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1 alarms, which is not a licensing basis for neither  
2 Option III or the DSS-CD is to provide operator, yes,  
3 with the opportunity to take an action in the case of  
4 maneuvering or there is low flow reduction events that  
5 results in a slow growing power escalations. So,  
6 those are the scenarios where the alarms are going to  
7 be useful and so that the operator has a chance to  
8 reduce power and prevent to have any stability to  
9 occur.

10 In the case of a two recirculation pump  
11 trip, for instance, it results in high grow rate,  
12 there is not going to be much difference in timing  
13 between the alarms and the trip itself. But the trip,  
14 itself, is set at the setpoint, such as the safety  
15 unit minimum critical power ratio, in that case is  
16 protected, regardless of the timing.

17 CHAIR REMPE: Thank you.

18 MR. CIFONELLI: So, from an operator's  
19 perspective, it is treated similar to other parameters  
20 that would approach an RPS setpoint.

21 Now the setpointality is reactor water  
22 level that was lowering toward a scram, the operators  
23 would get an alarm and the alarm response training  
24 experience in procedures would require the operators  
25 to take action to stop the adverse trend.

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1                   Similarly, with the OPRM RPS trip signal,  
2                   the alarm response provides guidance to the operator  
3                   on how to respond.

4                   MEMBER CORRADINI: Before you reach this  
5                   one.

6                   MR. CIFONELLI: Well, like Juswald said,  
7                   it is not quite as simple as reactor water level  
8                   because I can't see the oscillations going on in the  
9                   core. So, it has more to do with how we got there  
10                  that is a trip of a recirc pump, the alarm response  
11                  procedure has some certain additional control rods  
12                  until the alarm clears and to exit the exit region.  
13                  And that is expected to prevent a trip.

14                  CHAIR REMPE: Okay, thank you.

15                  MEMBER SKILLMAN: Let me ask this  
16                  question. A minute or two ago, one of the gentlemen  
17                  mentioned that you were in your second cycle of your  
18                  EPU. And in the EPU, you increased your power level  
19                  from 3467 to 3988. So, you have been at 3988 now for  
20                  18 months or 24 months or 30 months.

21                  MR. KHAN: Since July of 2012.

22                  MEMBER SKILLMAN: What have you learned in  
23                  plant behavior in your higher power level versus your  
24                  prior power level?

25                  MR. INCH: Actually on some of my slides

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1 in the design analysis presentation, I will be talking  
2 about things, our experience as it relates to MELLLA  
3 +.

4 MEMBER SKILLMAN: Well, give us one minute  
5 so, by the time we get there, we will have had a  
6 chance to think about it.

7 MR. INCH: Okay. We have got experience  
8 with moisture carryover, for example. That is one of  
9 the things that is impacted. We also have our  
10 operating experience with core flow and what our  
11 margins are. We have operating experience with regard  
12 to hydrogen water chemistry and how it interacts at  
13 EPU power levels. So, a few items.

14 MEMBER SKILLMAN: Thank you. I will wait  
15 for the next one. Thank you.

16 MR. GOODNEY: Okay. This is a licensing  
17 time line that shows the key milestones, most of which  
18 Bhalchandra already covered.

19 As he mentioned, there were RAIs were  
20 actually five rounds of RAIs. All responses have been  
21 submitted and, at this point, there are no open  
22 questions that we are currently working on.

23 Looking forward, we understand that the  
24 full committee is tentatively scheduled for July 2015,  
25 next month. Based on that, we are anticipating

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1 receiving the MELLLA+ license amendment as early as  
2 August and we have built our implementation plans for  
3 the license amendment around receiving that amendment  
4 in August.

5 The benefits for MELLLA+ for Nine Mile 2  
6 is similar to the two other plants that have already  
7 been reviewed. It does significantly expand the core  
8 flow operating margin at 100 percent power. That  
9 increased operational flexibility allows us to  
10 maintain the greater margins of the MELLLA+ rod line  
11 at the lower core flows and also reduce the number of  
12 control rod manipulations, as well as the number of  
13 plant downpowers required for rod pattern adjustments.

14 The power to flow map shows the comparison  
15 between the pre-EPU core flow window and where we are  
16 operating today. Today, our allowable core flow  
17 window is between 99 percent and 105 percent core  
18 flow. The actual in practice is somewhat less than  
19 that that I will show in the next slide.

20 With MELLLA+, the core flow window would  
21 be 20 percent, which, essentially, gets us back to  
22 where we were pre-EPU.

23 CHAIR REMPE: Before you leave that slide,  
24 I'm curious about the process. As I'm sure you are  
25 aware, you could have down to 80 percent with MELLLA+

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1 and you selected 85 percent. Could you discuss why,  
2 what analysis were done, et cetera?

3 MR. INCH: The original scoping evaluation  
4 was done for MELLLA+ in 2007 time frame as part of EPU  
5 by GE. And the plant considered what window was  
6 appropriate for Nine Mile and that is when the 85 was  
7 selected. Because I think Dan will show you the full  
8 power flow map and how we operate and where the  
9 transition to high speed on the recirc pumps and the  
10 rod lines. So, we really didn't need to go to a  
11 higher power -- a higher rod line, if you will, due to  
12 the way it was set up.

13 So, it was an early decision in the  
14 scoping.

15 MEMBER CORRADINI: So, we'll discuss that  
16 in closed session.

17 MR. INCH: We can.

18 MEMBER CORRADINI: Because I had the same  
19 curiosity.

20 MR. GOODNEY: Okay, moving on, the next  
21 slide shows the reactor power history. This is actual  
22 data over the last four months of the first EPU  
23 operating cycle, that would be towards the end of  
24 2013, early 2014. And it shows the downpowers for the  
25 rod pattern adjustments.

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1           This data was provided by our reactor  
2 engineering group and they are projecting that with  
3 the larger core flow window, that we would be able to  
4 eliminate all of the smaller downpowers. Those are  
5 down around the 98 percent range.

6           And for the larger downpowers, which are  
7 in the 65 to 80 percent thermal power, we would be  
8 able to reduce those by about one-half. So,  
9 significantly less rod manipulations by operations.

10           MEMBER CORRADINI: This isn't relevant to  
11 this, but since you showed the slide, what is the  
12 limiting rate of downpower? In other words, when you  
13 go down, you cannot go down faster than what percent  
14 per minute or any statistic? Or, if we are not  
15 allowed to speak about it here, we can wait.

16           MR. CIFONELLI: I don't have the exact  
17 number for the rate.

18           MEMBER CORRADINI: But is it like  
19 approximately a percent per minute or is it much  
20 faster than that?

21           MR. CIFONELLI: Normal manipulation of the  
22 system is slow. The two recirc groups each have split  
23 just to have a fast speed and a slow speed. And our  
24 operators use the slow speed, all normal  
25 manipulations.

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1 If we are in a --

2 MEMBER CORRADINI: Because it loss  
3 instantaneous here but I am sure it is not.

4 MR. CIFONELLI: -- normal situation, we  
5 can move it fast. And these are depicting a plan for  
6 activity maneuver for control rod sequence exchange.

7 MEMBER CORRADINI: Including the large  
8 downpowers or just the little blips?

9 MR. CIFONELLI: Both of them. So, this is  
10 a large time frame. So, if we were to expand the x  
11 axis out, it would show that the recirc flow has  
12 actually come down very slowly.

13 MEMBER CORRADINI: Okay, fine.

14 MR. INCH: The real limitations are on not  
15 the down but going up. And they are related to fuel  
16 preconditioning provisions.

17 MEMBER CORRADINI: It is a curiosity. We  
18 can wait until we are in closed session, if that is  
19 where it is appropriate.

20 MR. GOODNEY: Okay, the next slide is  
21 actually it is for the same time period as the  
22 previous slide but this shows the core flow. And  
23 really what it is intended to show is how narrow the  
24 core flow window that we currently have really is.  
25 You see is about 100 to 104 percent and that upper

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1 bound is really depending on where we are in the  
2 operating cycle and other conditions that George will  
3 talk in a little bit more detail later on what those  
4 limitations are.

5 The lower bound, at 100 percent, allows us  
6 to maintain one percent margins to the rod line. We  
7 really like to maintain around a two percent margin.  
8 So, MELLLA+ will be able to operate all the way down  
9 to 87 percent. It gives us a two percent margin for  
10 the 85 percent core flow we talked about earlier.

11 So, again, greater operational flexibility  
12 to be able to maintain our margins.

13 What MELLLA+ does not affect -- most of  
14 the major plant operating parameters, such as reactor  
15 pressure, core thermal power, licensed core flow,  
16 feedwater flow and temperature does not require any  
17 modifications to the balance of plant equipment.  
18 Again, it is very consistent with the other plants as  
19 well.

20 For Unit 2, the scope does include the  
21 revised power to flow maps and the DSS-CD stability  
22 solution, margin improvements in the standby liquid  
23 control system that we kind of already touched on, new  
24 OPRM settings to maintain margin to the MELLLA+ rod  
25 line, and the MELLLA+ reload analysis.

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1           We will be covering each one of these in  
2 more detail in the next two presentations with George  
3 and Dan, unless there are any further questions.

4           MEMBER SKILLMAN: Dale, let me ask you  
5 this. You are the Project Manager for this. In a  
6 24-month fuel cycle, my experience is you plan the  
7 cycle in advance. You load 680, 690 effective full  
8 power days. You allow 30 days for an outage or 28  
9 days or whatever your corporate goal is. And you  
10 allow some variance in there, perhaps, for a downpower  
11 for condenser cleaning or something such as that that  
12 you load 695 or nearly 700 days effective full power  
13 at 235.

14           One of the great benefits of MELLLA+ is  
15 not using that reactivity that is consumed when you  
16 are maneuvering. You don't have to do those deep  
17 draws and you don't have to utilize that reactivity to  
18 bring the plant back up, overcome xenon, that type of  
19 thing.

20           Do you have any idea how many effective  
21 full power days you gain in your fuel cycle by going  
22 to MELLLA+?

23           MR. KHAN: I couldn't answer that off the  
24 top of my head but our Fuels representative may be  
25 able to help on that.

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1 MR. CLOSE: My name is Bob Close. I'm  
2 with Exelon Nuclear Fuels, Senior Staff Engineer.

3 And I am actually going to let you down  
4 gently and tell you that the actual, if you would,  
5 measurable capacity factor benefit from elimination of  
6 the downpowers for the rod withdrawals, and even the  
7 minor notching, it really probably only comes out to  
8 maybe a couple of effective full power days'  
9 difference in capacity factor. Really, the benefit is  
10 really seen in the reactivity management that you are  
11 not doing.

12 So, it doesn't really translate itself, if  
13 you would, into a fuel economy benefit that is large.  
14 It is really about the decrease in reactivity  
15 management, where it has the big value. You are just  
16 moving control rods less. You are maneuvering the  
17 plant through a maneuver from 100 percent down to 65  
18 percent or even just 80 percent. You know it is not  
19 insignificant to watch all the equipment and make sure  
20 everything moves smoothly. So, that is really where  
21 we see the value.

22 On the economics, it is really just maybe  
23 an effective full power day that is scrubbed off.

24 MEMBER SKILLMAN: Thank you.

25 MR. GOODNEY: Okay, thanks, Bob.

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1           In terms of the implementation, the  
2 installation and tests associated with MELLLA+  
3 implementation are governed by the station design  
4 change and work control processes. These process  
5 ensure that all of the engineering documentation,  
6 procedures, and training, are all completed, in order  
7 to support the MELLLA+ implementation.

8           Once we receive our license amendment, we  
9 will implement within 90 days in accordance with our  
10 MELLLA+ licensing submittal. We are currently  
11 scheduled to complete within those 90 days.

12           The actual implementation is in two  
13 phases. We have both an offline, as well as an online  
14 portion for implementation.

15           If you go to the next slide, it kind of  
16 breaks down the work packages. The offline, as  
17 indicated here, has already been completed. And that  
18 was in May 2014, during the refueling outage. During  
19 that outage, we implemented the tech spec amendment  
20 for the enriched boron. And we also installed the  
21 DSS-CD stability solution.

22           That equipment has already been installed  
23 and fully tested. We are currently operating the  
24 DSS-CD trip output bypass to prevent the confirmation  
25 density algorithm RPS trips, pending implementation of

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1 the tech spec change.

2           Once we receive our license amendment, we  
3 will be performing the online portion, which is  
4 currently scheduled in September 2015. We will enable  
5 the DSS-CD by removing the jumpers.

6           There was a question that was relayed to  
7 us, I believe from ACRS last weekend, the processing  
8 for arming the DSS-CD as well as how do we ensure that  
9 it is operating correctly.

10           We did add a slide to the presentation.  
11 Maybe at this point, we can go to the last slide. And  
12 this provides kind of a sequence of how that is going  
13 to happen but basically, there are eight physical  
14 jumpers installed. There are two per each APRM logic  
15 module.

16           We will be removing the jumpers off from  
17 one module at a time, one channel at a time to  
18 maintain protection while we are performing the  
19 activity.

20           We also will be installing what is called  
21 an RPS test device. This is a device that is  
22 installed in the RPS circuitry. It allows us to be  
23 able to perform this work, as well as perform the  
24 functional testing without actually bringing in a half  
25 scram.

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1 MEMBER CORRADINI: Without doing what?

2 MR. GOODNEY: Without bringing in half of  
3 the scram.

4 MEMBER CORRADINI: Okay.

5 MR. GOODNEY: So, we can actually see the  
6 contact state change in that circuit, without dropping  
7 off the main relays.

8 So, what are the appropriate LCO actions  
9 for the first logic module? We will have the RPS test  
10 device installed. We will physically remove the two  
11 jumpers for that particular channel, after which we  
12 will perform the channel functional test and that will  
13 check the logic all the way from the APRM all the way  
14 out to the RPS circuits.

15 Once that is complete, we will remove the  
16 test device, exit the LCO, and then we will do it for  
17 the next channel. So, that is physically how we will  
18 be removing the jumpers.

19 And that basically arms the DSS-CD trip  
20 output into the RPS.

21 Does that answer that question? Okay.

22 All right. We will also be making the set  
23 point changes. There are some minor setting changes  
24 for the OPRM for the defense-in-depth algorithms. We  
25 will also be changing the power and flow operating

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1 window for the DSS-CD, and the APRM setpoint changes  
2 will also be made at that time.

3 While that is going on, we are going to be  
4 implementing the MELLLA+ reload analysis that consists  
5 of installing a new 3D monocore data bank and also the  
6 MELLLA+ core operating limits report.

7 Once those two activities are completed,  
8 the tech spec will be implemented, basically, and then  
9 we will be ready to move in to the actual MELLLA+  
10 testing, which, again, will occur at power.

11 We have later on in our presentation more  
12 detail on what that MELLLA+ testing looks like, power  
13 levels, what type of tests we are going to be  
14 performing at each power level.

15 So, I will defer more discussion on that  
16 until we get to that part of our presentation.

17 Okay, so that really concludes my portion  
18 of the overview. Again, I think the benefits are  
19 clear from a project standpoint. We are, the whole  
20 organization, the site, the maintenance, all the  
21 departments are currently planning on doing the  
22 implementation. It is the second week in September.  
23 So, we are prepared for that.

24 Unless there are any more questions for  
25 me, I will turn it over to George for the design and

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1 analysis.

2 MR. INCH: Good morning. My name is  
3 George Inch. I am the Senior Staff Engineering in the  
4 Engineering Department at Nine Mile Point Nuclear  
5 Station at Exelon.

6 What I would like to do is provide you a  
7 basic overview of the approach that was set up when we  
8 started the MELLLA+ project. And when we did that  
9 evaluation, there are two key features that we  
10 considered important. The first one was we made a  
11 decision to use a 92 percent atom percent of boron-10.  
12 And that includes margin and eliminates any eliminates  
13 any issues with suppression pool temperatures. So, we  
14 are going to have a higher rod line, so in an ATWS  
15 event, you have more heat added to the suppression  
16 pool.

17 So, by using the enriched boron, we are  
18 able to actually improve the margins, as opposed to  
19 changing those.

20 MEMBER SKILLMAN: George?

21 MR. INCH: Nine Mile 2 is --

22 MEMBER SKILLMAN: George, let me ask this.  
23 Do you have boron at any other atom weight percent on  
24 this site?

25 MR. INCH: Dale?

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1 MR. GOODNEY: Yes, we do. At Nine Mile  
2 Point Unit 1, we have got boron that I believe is  
3 about 65 percent.

4 MEMBER SKILLMAN: So, explain to us the  
5 rigor and discipline to ensure that the right boron is  
6 in the right place because it all appears the same.  
7 If you have a handful of one and a handful of the  
8 other, you honestly can't tell the difference.

9 How do you ensure that the correct atom  
10 weight percent is where it is supposed to be at this  
11 unit?

12 MR. GOODNEY: Well, one of the ways we  
13 handle that is through the inventory control system.  
14 Each unit has its own specific item number that we  
15 call it. So, Unit 1 has its item number. Unit 2 has  
16 its item number. And from there it is controlled, the  
17 installation of it is controlled by the procedures and  
18 work packages when they have to adjust the  
19 concentrations.

20 We do know that from putting in the 92  
21 percent boron, it is a slightly different consistency  
22 than the other boron that was in there. So, they may  
23 be able to tell just physically by looking at it but  
24 we do have controls in place through the inventory  
25 control system to make sure that they are kept

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1 separated and that the physical work packages ensure  
2 that they only put in the correct item number for that  
3 particular plant.

4 MR. CIFONELLI: The additions are  
5 controlled procedurally and the procedure will  
6 reference the inventory control system, the symbol  
7 number that is associated with each concentration of  
8 boron. The Chemistry Department is the department who  
9 does any adjustments or adds to the tank and then  
10 proceeds to derive the configuration control. It is  
11 part of a configuration. It is part of the process.

12 MR. GOODNEY: Each bag is also labeled  
13 with the specifications for the content, to include  
14 the enrichment, as well as our item number would be  
15 right on the bag itself.

16 MEMBER SKILLMAN: If one were to review  
17 your corrective action program for the last say 60  
18 months, the last five years, would there be any items  
19 that would point to failure to use the correct atom  
20 weight percent of boron?

21 MR. GOODNEY: I would say no but that  
22 would be a big deal.

23 MEMBER SKILLMAN: Yes, it would.

24 MR. GOODNEY: And I think we all would be  
25 aware of that. And the answer is no, there are none.

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1 MEMBER SKILLMAN: Fair enough. Thank you.

2 MR. CIFONELLI: Another piece of that  
3 would be also a technical specification violation and  
4 would be reportable.

5 MR. INCH: The 92 percent boron also would  
6 demonstrate it improves the standby liquid control  
7 system redundancy. I will talk about that in a  
8 little bit more detail.

9 We have mentioned it before and we will  
10 probably be repeating ourselves quite often but our  
11 key aspect of how we have analyzed both the ATWS and  
12 OPRM analyses and the ATWS with instability is with  
13 the redundant reactivity control system features with  
14 the automatic standby liquid control and the runback.  
15 And what that helped us with is, obviously that we are  
16 able to achieve the runback and the SLC injection more  
17 rapidly.

18 So, the requirements for operators are  
19 relaxed so that they are not having to react as fast  
20 for the events.

21 MEMBER SKILLMAN: Before you go on, you  
22 say not as fast. You have got to initiate SLC  
23 injection in 98 seconds. Is that a change or is that  
24 what you had prior?

25 MR. INCH: That is the same.

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1                   MEMBER SKILLMAN:    The same?    Yes, sir.  
2                   Okay, thanks.

3                   MR. CIFONELLI:    That is also an automatic  
4                   feature.

5                   MR. INCH:        This is just an overview of  
6                   different aspects of going through in the body of the  
7                   presentation.

8                   What I would like to cover first is what  
9                   our experience is for the power uprate and what core  
10                  flow operating margins we have achieved.

11                  When we did power uprate, we did, in order  
12                  to get to full EPU power, we needed to restore the  
13                  design performance of the jet pumps.    There was  
14                  fouling involved.    And in order to do that, we made  
15                  the decision to install new mixers that were the same  
16                  design mixers but they had an anti-fouling coating.

17                  Those mixers were successful in restoring  
18                  the design performance back to original design.    And  
19                  when we did the power uprate testing, the performance  
20                  of the jet pumps actually plotted right along the  
21                  performance line from 1987, the original startup of  
22                  the jet pump mixers.

23                  Now, for EPU power with the limiting power  
24                  core resistance, even though we are licensed for 105  
25                  percent core flow, we had the GE calculations

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1 indicated our max capabilities are going to be 103.9.

2 We have achieved approximately 103.9. It  
3 is depending on where you are in the operating cycle  
4 and what rod pattern it is. It is somewhere between  
5 103 and 103.5.

6 Under those conditions, we have to operate  
7 with the flow control valves full open. So, and when  
8 you are at full open, the drive flows are somewhere  
9 around 46,000 to 46,500 GPM.

10 So, at end of cycle conditions, as the  
11 core DP changes, we are able to get to the 105 percent  
12 window for increased core flow.

13 So, you are at EPU, the MELLLA line is 99  
14 percent core flow, operations seems to maintain margin  
15 to that. So, as a practical matter, you have a very  
16 small window. I think Dale showed you the operating  
17 data. And that is with this system new clean jet  
18 pumps, the coating seems to be working. We haven't  
19 seen any fouling but that is a very small margin  
20 window.

21 MEMBER BALLINGER: This is a titanium  
22 coating?

23 MR. INCH: Yes.

24 Our operating experience for moisture  
25 carryover with power uprate is also important because

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1 one of the things that is impacted with MELLLA+ is  
2 moisture carryover. As you operate it at lower core  
3 flows the steam separator performance changes, as you  
4 get higher quality steam.

5 So, what our experience is with EPU is our  
6 moisture carryover improved, compared to pre-EPU  
7 conditions. We were operating with moisture  
8 carryovers, so 0.05 to 0.07 at CLTP conditions and  
9 after EPU we saw moisture carryover in the order of  
10 0.025.

11 So, and that is important when you go on  
12 to our assessment of what the impact of MELLLA+ was  
13 because the predictions for the design predictions for  
14 moisture carryover were indicating the potential for  
15 us to be upwards of 0.23, 0.24 weight percent, under  
16 some limiting conditions during the cycle. It wasn't  
17 the whole cycle but it was about five percent of the  
18 time we might run into that.

19 MEMBER CORRADINI: And that is at 85  
20 percent flow?

21 MR. INCH: Eight-five percent flow, yes.

22 So, now those predictions also were saying  
23 for EPU, they were expecting us at those same state  
24 points to be on the order of 0.125. We haven't seen  
25 that. We have seen, as I said, we haven't seen

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1 moisture carryover to get up above 0.03.

2 MEMBER CORRADINI: But just so I guess I  
3 should know this, but I don't, so this is more  
4 investment for maintenance issues relative to the  
5 turbine than it is a safety issue.

6 MR. INCH: Yes, that is correct.

7 CHAIR REMPE: Remind me, because I have  
8 forgotten. Did you put a new dryer in for Nine Mile  
9 when you did the EPE?

10 MR. INCH: No, it is the existing -- the  
11 original dryer.

12 MR. POWERS: Your moisture carryover is  
13 limited, primarily, by inertial impaction?

14 MR. INCH: Excuse me. I didn't hear you  
15 clearly.

16 MR. POWERS: Moisture carryover is limited  
17 by inertial impaction and droplets.

18 MR. INCH: I think the moisture carryover  
19 is really, the increase is related to the steam  
20 separator performance and how effective it is in  
21 removing moisture. And there is an optimum band on  
22 the separators in terms of the quality coming off.

23 As the quality comes up higher, you  
24 actually get higher moisture breakthrough from the  
25 steam separators. So, the moisture carryover for them

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1 is really for MELLLA+ is really not related to the  
2 dryer. It is related to the core exit conditions and  
3 the steam separator performance.

4 MR. POWERS: But the mechanism at which  
5 separators and dryers operate is primarily inertial  
6 impaction.

7 MR. INCH: Yes, okay.

8 MR. POWERS: So, at higher velocity, you  
9 should get more inertial impaction.

10 MR. INCH: I think GE, I'm not sure if one  
11 of the folks from General Electric might be able to  
12 expand on it. And I think I have a backup slide from  
13 GE.

14 MEMBER CORRADINI: I guess Dr. Powers'  
15 question is kind of the same as mine as to why. And  
16 so what I am hearing you say politely is it is a black  
17 art and you just found this empirically and you don't  
18 know why.

19 MR. INCH: No, GE knows why. There is  
20 testing performance in terms of how the separators  
21 work.

22 So, that curve, can you see it? You'll  
23 see there the inlet quality and on the right-hand  
24 side, carryover and then carry under. That is for the  
25 GE design separator. So, depending on what the

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1 quality is, you get actually more carryover coming out  
2 of it.

3 Exactly the details of how that works in  
4 the separator design, I would need to ask GE to  
5 provide some additional elaboration.

6 That is, functionally, from an analysis  
7 standpoint, as to why they are predicting the  
8 carryover to go up because they are predicting higher  
9 quality in central locations in the core for the  
10 certain operating points in the cycle, at the lower  
11 core flow.

12 So, moving on to the -- so, our analysis  
13 for radiological, we have evaluated up to 0.35 weight  
14 percent and that was the original radiological  
15 evaluations were done for that. And we have analyzed  
16 the piping and 0.425 weight percent. We used that  
17 because that is the limiting quality for the MSIVs,  
18 the outboard MSIVs. So, as long the quality leaving  
19 the reactor is 0.25 weight percent or less, then the  
20 quality at the MSIV is below the threshold for  
21 possible damage to the outboard MSIV.

22 And there is monitoring in place for the  
23 moisture carryover to control and identify if we are  
24 approaching the limits. And then there is also the  
25 ability of operations and reactor engineering to

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1 adjust our power level to stay below 0.25 weight  
2 percent.

3 The next slide is the long-term stability  
4 solution. The DSS-CD is basically designed to improve  
5 the stability solution over the Option III and it  
6 initiates insertion to terminate the oscillation prior  
7 to any significant amplitude growth.

8 It replaces Option III. Option III stays  
9 in the background. There are some setpoint changes on  
10 the Option III. So, there are some changes that were  
11 made during the process that Dale will explain when it  
12 is implemented.

13 It protects against the safety limit MCPR  
14 for stability events. And we didn't take any  
15 exceptions to the DSS-CD LTR. I believe the latest  
16 LTR, our submittal is Rev. 7. I think the final  
17 approved version is Rev. 8 of that LTR.

18 With regard to the automatic backup  
19 stability and the manual backup stability, Dan  
20 Cifonelli is going to summarize our power flow maps  
21 and he navigates the different regions and how you go  
22 from manual to automatic. And so, if you have any  
23 questions there, I think Dan will get into that in  
24 some detail.

25 And the tech specs do require if you can

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1 implement the manual, I can't imagine why you wouldn't  
2 be able to but if you couldn't implement it, you are  
3 required to get below 18 percent power.

4 Unit 2 Nine Mile has significant  
5 experience with the Option III system that was  
6 installed in 2000 time frame and it has been installed  
7 for 15 years. And we have been operating for  
8 approximately one year, a little over one year, with  
9 DSS-CD in the background, with the jumpers in. And  
10 the alarms would have come in if there was any issue.  
11 So, we haven't had any alarms.

12 With MELLLA+, the supplemental reload  
13 licensing submittal was provided to the NRC in  
14 February of 2014. Now, we are implementing now for  
15 cycle 15. So, with cycle 15, we are also basing it on  
16 Rev. 4 of the NEDC 33173 and that changes some of the  
17 limitations and conditions that apply.

18 For the GE 14 core design, our safety  
19 limit for two loop operations going to increase from  
20 1.07 to 1.09, when you add the LTR limitation in  
21 Condition 9.5. That includes the off-rated  
22 uncertainty for single loop operation that is related  
23 to core flow uncertainty of 0.03.

24 Here, I identified what our power  
25 densities are, as it relates to the application in

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1 these adders.

2 As you can see for the limiting point M on  
3 the power flow map, I think that is the 55 percent  
4 core flow point, our power density is 43.3, at that  
5 point. That is megawatts thermal million pounds per  
6 hour as a rated power. And I'm sorry, at Point M, it  
7 is 51.86.

8 The Redundant Reactivity Control System  
9 for the automatic start is on high reactor pressure.  
10 So, for analysis purposes, we used 1095 psig. And the  
11 nominal delay setting is 98 seconds. That system has,  
12 it is a digital logic so there are digital timers.  
13 There is minimal setpoint trip but we do, in the  
14 analysis, we use 120 seconds for that initiation  
15 delay, rather than the 98 seconds.

16 Now for the runback, it is also on high  
17 dome pressure. Now, of course, these are coincident  
18 with the APRMs not downscaled. They are greater than  
19 four percent.

20 For the runback, it is a nominal delay of  
21 25 seconds. And again, there are digital timers and  
22 analytically, we use 33 seconds.

23 MEMBER CORRADINI: Sorry I don't know.  
24 What does not downscale mean? I guess I interpret it  
25 to mean that you have got a coincident signal of

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1 pressure and power but what does not downscale imply?  
2 I didn't get that.

3 MR. CIFONELLI: The downscale setpoint for  
4 the APRMs is four percent. It is the relay kicks up.

5 So, on initiation of a reactor scram, the  
6 rods don't go in or a portion of the rods go in. The  
7 power does not come down below four percent --

8 MEMBER CORRADINI: Per predictor. Okay.

9 MR. CIFONELLI: -- if it does not trip  
10 that downscale setpoint.

11 MEMBER CORRADINI: Oh, so this is total  
12 power.

13 MR. CIFONELLI: Correct. This is neutron  
14 APRM power.

15 MEMBER CORRADINI: Right.

16 MR. CIFONELLI: If you don't get the  
17 downscale, it triggers the timer.

18 MEMBER CORRADINI: Okay, thank you.

19 MR. CIFONELLI: High pressure, not  
20 downscale on power.

21 MEMBER CORRADINI: Those two coincident.

22 MR. CIFONELLI: The 25-second timer  
23 starts.

24 MEMBER CORRADINI: Okay, thank you.

25 MR. INCH: Now, with the runback, the RRCS

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1 sends a signal out to the low control valves to ramp  
2 closed. It also has controls to open the min. flow  
3 valves in the feed pumps to make sure you have  
4 adequate min. flow on the pumps.

5 That inner analysis that occurs over 21  
6 seconds, assuming you are at 100 percent power. So,  
7 it is a rapid runback. You know at the point that  
8 that happens, level will begin to drop and the  
9 operators will then need to reestablish control. I  
10 think Dan will go through the EOPs and how that  
11 interfaces them.

12 In our analysis, there is a couple of  
13 operator actions we have to assume for a MELLLA+  
14 required to analyze the turbine trip with bypass for  
15 ATWS with instability in the dual recirculation pump  
16 trip.

17 Now, for the turbine trip with bypass, you  
18 still get the high pressure signal. So, the automatic  
19 runback feature still occurs. For the dual recirc  
20 pump trip, the turbine stays online, so you don't get  
21 the high pressure signal. And for that case, our  
22 analysis used 270 seconds and we also based it on the  
23 operator taking action to try and scram the plant  
24 within the 20 seconds to get a feeling -- to set the  
25 clock, if you will.

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1           MEMBER CORRADINI: Can I ask a question  
2 here? Because the time difference -- maybe I am  
3 misunderstanding, so correct me.

4           So, the automatic runback for a turbine  
5 trip with bypass s 25 -- maybe I have got this wrong.  
6 So, it seems like with a different one, we are  
7 allowing up to 270 seconds before manual operator  
8 action. Why the large difference? Maybe I am not  
9 understanding the difference between the two actions.

10          MR. INCH: Well, the automatic, that is  
11 the way the system is currently -- has been designed  
12 for a long time.

13          MEMBER CORRADINI: That I have got but I  
14 don't understand why -- what is it about the system  
15 that allows me to wait 270 seconds for an operator  
16 reaction runback. That is what I don't get.

17          MR. INCH: The dual recirculation pump  
18 trip for ATWS with instability is, basically, an event  
19 that we were required to analyze for the first time in  
20 any detail for instability. And I think Dan is going  
21 to talk about the EOPs and the complexity of the EOPs  
22 that you need to work through.

23          MEMBER CORRADINI: But give me a cheat  
24 sheet. I am still --

25          MR. CIFONELLI: Let me try a little bit

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1 here. I'm not the design analysis guy but from the  
2 operator perspective, the turbine trip distracts the  
3 steam folks right away. So, my subcoolant profile is  
4 different.

5 And our recirc pump trip, where I don't  
6 get the automatic quick runback, if you will, in the  
7 recirc pump trip, the turbine is still online.  
8 Heating is still happening in feedwater. So, it is  
9 a slower moving instability event.

10 MEMBER CORRADINI: So, if I could say it  
11 back.

12 MR. CIFONELLI: So, there is more time  
13 before the growth -- before the onset of oscillation.

14 MEMBER CORRADINI: So, I saw a plot  
15 somewhere in your submittal that the realistic cool  
16 down is pretty doggone long. So, you are taking the  
17 realistic cooldown that allows you ample time to react  
18 from an operator action standpoint?

19 MR. CIFONELLI: That is correct. And if  
20 you didn't have that at cooldown, you would have had  
21 the high pressure and the automatic would kick in.

22 DR. MARCH-LEUBA: This is Jose  
23 March-Luebea from Oak Ridge. Historically, we always  
24 analyze ATWS to determine trips or MSIV closure  
25 because that is what is more damaging to the core.

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1 Right?

2 But when we analyzed Nine Mile Point with  
3 the automated actions, the ATWS high, turns out it did  
4 not oscillate at all.

5 So, when they were doing analysis to  
6 figure out that the limited output was a much lower  
7 level of activity, a very mild output, it was a  
8 two-pump RPV with a turbine open, which has never even  
9 been analyzed before --

10 MEMBER CORRADINI: Anywhere else.

11 DR. MARCH-LEUBA: -- anywhere else, simply  
12 because it is so mild that you do not have to analyze.

13 Now, in this two-pump RPV, you are not  
14 supposed to scram until the oscillations develop and  
15 then the operator sees oscillations and pushes the  
16 button. The ATWS starts there, when the rods won't go  
17 in.

18 MEMBER CORRADINI: Oh, so from a timing  
19 standpoint, everything is delayed.

20 DR. MARCH-LEUBA: Everything is very slow  
21 and of course the cooling transient in the two RPV is  
22 much milder. So, the selections are much milder.

23 MEMBER CORRADINI: All right. So, let me  
24 ask, since you happened to volunteer this information.

25 So, if I look at other designs and other

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1 things we have looked at, this is a whole lot  
2 different and part of it is the feedwater setup and  
3 the characteristic time of cooldown, I assume, is  
4 driving this.

5 DR. MARCH-LEUBA: And the final  
6 temperature.

7 MEMBER CORRADINI: And the final  
8 temperature. Okay. All right, that's what I thought  
9 but I wanted to make sure because there is a really  
10 big difference.

11 DR. MARCH-LEUBA: With a turbine trip, you  
12 end up with the temperature of the condensate as time,  
13 which could be as low as 68 degree Fahrenheit.

14 With the turbine running after pump trip,  
15 you end up with a reduction in fuel water of only 50  
16 to 80 degrees but you have less.

17 MEMBER CORRADINI: Okay.

18 MEMBER SCHULTZ: And then the manual scram  
19 within 20 seconds of the dual recirc pump trip, that  
20 happens after the pump trip, 20 seconds after the pump  
21 trip is the expectation for the scram?

22 MR. CIFONELLI: That's correct.

23 MEMBER SCHULTZ: And then there is plenty  
24 of time to initiate the feedwater runback.

25 MR. CIFONELLI: That's correct.

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1 MEMBER SCHULTZ: Thank you.

2 DR. MARCH-LEUBA: This is Jose again. On  
3 that 20 seconds, it sounds very fast but all the  
4 analysis assumed that the operator has to do it but it  
5 fails. So, no credit is given for that action.

6 MEMBER BALLINGER: We have another number  
7 that we have been hearing time and time again, which  
8 is 90 seconds.

9 DR. MARCH-LEUBA: That is for feedwater  
10 reduction.

11 MEMBER BALLINGER: Is the 270 seconds the  
12 equivalent of the 90 seconds?

13 DR. MARCH-LEUBA: Correct.

14 MEMBER BALLINGER: Okay, that is what I  
15 was trying to get at.

16 MEMBER CORRADINI: But what confused me is  
17 essentially the setup of all the cooldown conditions  
18 and the assumptions and other things we have seen.

19 MEMBER BALLINGER: Right, especially the  
20 feedwater temperature.

21 MEMBER CORRADINI: Correct.

22 MR. CIFONELLI: In the closed session, we  
23 do have some of those details.

24 MEMBER CORRADINI: That's fine. Just,  
25 since you brought it up.

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1 MEMBER SKILLMAN: George, for the two  
2 automatic actions, the 98 seconds and the 25 seconds,  
3 how often are those tested?

4 MR. INCH: The testing for the Redundant  
5 Reactivity Control System, that logic is tested on a  
6 refuel outage basis.

7 MEMBER SKILLMAN: Every 24 months. And  
8 how about the operator actions? How often do the  
9 operators rehearse that and demonstrate their  
10 competence?

11 MR. CIFONELLI: The ATWS event is  
12 practiced often in this simulator. I don't know if I  
13 have a number to give you. The time critical operator  
14 reactions were validated. And I am going to talk  
15 about how that validation occurred.

16 Revalidation is required every five years.

17 MEMBER SKILLMAN: Thank you.

18 MR. INCH: I'll be going into some more  
19 detail with what we just sort of entered into in the  
20 closed session.

21 So, in the licensing basis ODYN analyses,  
22 we do credit the automatic features that we just spoke  
23 about. That was true for extended power uprate and it  
24 is also true for the MELLLA+.

25 The limiting event is the pressure

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1 regulator failure to open. And for MELLLA+, the peak  
2 pressure and PCT, they are very close. They are  
3 essentially interchanged.

4 The peak upper plenum pressure, which is  
5 largely governed by the SRV setpoints, there is a  
6 small variation there, are also very close.

7 And the time to hot shutdown is reduced  
8 because of the boron-10 in our licensing analysis.

9 The boron-10 also improves our margin to  
10 the HCTL limits for the suppressionable temperature.  
11 And our analyses and submittal are based on the  
12 allowance in the MELLLA+SER limitation in Condition  
13 12.18.b that eliminates the need for a best estimate  
14 TRACG containment evaluation for HCTL because we have  
15 implemented the boron-10.

16 We have essentially, our suppression pool  
17 is back to what it was with the original licensed  
18 thermal power at 75 percent core flow, which is the  
19 limitation and condition.

20 Our peak containment pressure is reduced  
21 from 7.0 to 6.5 pounds, our design limit is 45.

22 And from a practical standpoint, Dan, you  
23 know your experience in the simulator, which we have  
24 updated the simulator and benchmarked it to make sure  
25 it can reproduce the ATWS licensing bases cases, and

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1 our experiences with those realistic scenarios that  
2 you are achieving hot shutdown prior --

3 MR. CIFONELLI: That's correct, which -  
4 and I'll talk more, as you know, about that.

5 MR. INCH: We've also - there's a margin  
6 of improvements in terms of the redundancy. Because  
7 of the Boron-10 we can now satisfy the boron  
8 equivalent control capacity requirement with one pump  
9 at 40 gpm, and we've also completed supplemental  
10 analyses that show we meet all of the licensing basis  
11 criteria with the single standby liquid control pump.

12 I'd like to - the test matrix, if we could  
13 put that up? Here's our MELLLA implementation and  
14 test matrix. We've got - there's also a flow chart  
15 that we can kind of look at together with this  
16 hopefully in your handouts.

17 Test condition two is probably pretty much  
18 the first one we get to, which is where we're going to  
19 do the pressure regulator dynamic testing as we come  
20 down. So we'll be coming down to test condition two,  
21 then to test condition three on the MELLLA boundary,  
22 and taking data as we reduce core flow in the MELLLA  
23 boundary.

24 For all, you know, stability monitor  
25 performance, steam separator performance, we'll be

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1 taking radiological monitoring data for comparing it  
2 and neutron surveillance data at these points. And  
3 then at test conditions two and three, we will do some  
4 dynamic testing as a baseline for MELLLA+ and then  
5 we'll enter test condition five which is the 55  
6 percent core flow.

7           You can see we maintain approximately a  
8 two percent margin to the MELLLA+ boundary. And then  
9 we'll also repeat the dynamic tests at test condition  
10 eight, and then again at test condition 11 as we come  
11 up.

12           They will be - all along those we'll be  
13 also collecting the steady state data. As you can  
14 see, the separator performance is done at one, three,  
15 five, eight, and then back at test condition 12.

16           We'll be taking stability performance  
17 data. What that means is they'll be downloading data  
18 from PRNM and then GE will be using that to analyze  
19 APRM noise and the OPRMs.

20           That's - we expect that testing to take  
21 approximately five days, five to six days, and it's  
22 currently slotted for the second week of September.  
23 It's - you know, obviously we need to take an extended  
24 down power to maneuver the plant and there's fixed  
25 windows of opportunity when that can best be managed

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1 for the plant so, you know, changes in schedule will  
2 have an impact on us.

3 The last thing I wanted to go over was the  
4 --

5 MEMBER POWERS: Before you go on too much,  
6 could you remind me again what are the data that you  
7 will collect in each of these tests?

8 MR. INCH: Okay.

9 MEMBER POWERS: And given that each test  
10 is a single test at a prescribed set of conditions,  
11 how will you assess the variability of that data?

12 MR. INCH: Well, for the dynamic tests for  
13 example, what we're looking at is the impact of the  
14 rod line on the control system response. So it's  
15 controlling pressure and also reactivity with levels.  
16 So on the higher rod lines, there could be an impact.

17 MEMBER POWERS: But what I'm trying to  
18 understand a little better, you say, "Okay, I'm in  
19 these conditions and I want to assess on the control,"  
20 what is it exactly that you will measure? I mean,  
21 what is the assessment?

22 MR. INCH: Okay, so for the feed water  
23 level control we're looking at the control systems'  
24 decay ratios and also the potential for any power  
25 changes related to level oscillation. So, you know,

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1 you change the feed water level, you change  
2 reactivity, and there's a feedback loop, so its  
3 primary decay ratio and margins on any flux response.

4 The same thing with pressure as the  
5 reactor control is a control variable. So if the  
6 control - and there's a feedback loop through the  
7 core. So as you make a pressure change, you're going  
8 to see on a higher rod line more reactivity. So we're  
9 looking at stability of the regulator and also margin  
10 to - on neutron flux to any flow bias lines.

11 For the moisture carryover, we'll be  
12 monitoring just that, you know. We'll be taking  
13 measurements in the condenser for sodium-24 and then  
14 comparing that to the design limits and trending it as  
15 we go down.

16 For the - you know, we're a hydrogen water  
17 chemistry plant, and that - for that test we're  
18 looking primarily at main steam line dose. So, you  
19 know, I had a slide on some operating experience on  
20 that.

21 The - we're taking baseline data for the  
22 stability monitor. Juswald, could you speak to the -  
23 how - what GE does with that?

24 DR. VEDOVI: This is Dr. Juswald Vedovi  
25 from GEH. Yes, for as far as stability, we're going

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1 to pull that OPRM cell signals, so these are the  
2 amplitude, relative amplitude confirmation counts,  
3 periods that are available for each OPRM cells from  
4 the OPRM system.

5 We vary the resolution around 100  
6 milliseconds and we use those as confirmation of the  
7 additional data that we review in a number of cycles  
8 for different plants like Nine Mile Point 2. So we  
9 use that to confirm that the noise level in the plant  
10 is in the range of what we assessed.

11 MEMBER POWERS: Well, I might add that may  
12 be good enough. Let me ask this question. You come  
13 back to TC 8, okay, you make these measurements. Now,  
14 if tomorrow afternoon I redid the test, made exactly  
15 the same measurements that you did there, how much  
16 variability would you expect?

17 MR. INCH: We're making - we wouldn't  
18 expect much at all. What we're trying to do is  
19 establish - well, we're establishing a steady state  
20 test condition at a power flow point. And what we're  
21 really -

22 MEMBER POWERS: You're controlling a lot  
23 of things. You're not controlling everything on the  
24 face of the planet, okay. So some things are - you're  
25 just not controlling. I mean, you have no control,

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1       okay, and there are things that you don't know enough  
2       to control. How big is the variability in the result?

3               MR. INCH: I'm not sure what variables  
4       that we're not controlling that would -

5               MEMBER POWERS: The day of the week.

6               MR. INCH: Hmm?

7               MEMBER POWERS: The day of the week, the  
8       ambient atmospheric pressure, the spinning element of  
9       the earth that particular day, something that has an  
10      influence that you just simply don't know.

11              MEMBER CORRADINI: I think Dana is asking  
12      a question, so do you do any repeatability at any of  
13      these points? So in other words, you come to do TC 5  
14      tests I think or one of these, and you come back and  
15      you'll return to do TC 5 on another day to see - just  
16      to confirm your expectation that you get the same  
17      result. That's what I think he's asking.

18              MEMBER BALLINGER: Dana's not being  
19      facetious. We're really trying to get after this  
20      variability and uncertainty that we've been talking  
21      about.

22              MR. INCH: What I'd like to do is take  
23      that and get back to you on that, and we'll talk about  
24      it in a closed section because I'm not sure which  
25      variables you're referring to, so if you give us -

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1                   MEMBER POWERS: Well, I mean, things that  
2 you simply don't know. I mean, it's not your fault.  
3 There are always things that people don't know.

4                   MR. INCH: So what our plan is doesn't  
5 include that. I think our assumption is that we're -  
6 we are making sure that the reactor's truly at a  
7 steady state condition.

8                   So from the reactivity standpoint, we have  
9 established, you know, stable power conditions. We're  
10 not in the middle of a xenon transient for example.  
11 And then we're making sure that feed water temperature  
12 is within a normal band that's no longer changing.  
13 Pressure is under control. Water level is under  
14 control.

15                   So for that power state point, the balance  
16 of the plant is confirmed to be within the band where  
17 we would say yes, you're at, you know, a normal steady  
18 state initial condition for that power flow point.

19                   We would expect that to be repeatable and  
20 not, you know, subject to arbitrariness because you  
21 know, you have to control core flow. You have to  
22 control the rod pattern and pressure level,  
23 temperature. Those are the key variables and they're  
24 all tightly controlled.

25                   MEMBER CORRADINI: So can I try it another

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1 way because I have a feeling this is a tough test to  
2 do? So another way that I might answer it is I get to  
3 TC 5 one day and I don't get to the exact TC 5 the  
4 next time.

5 In other words, I don't get exactly the  
6 same flow or the same power with everything being  
7 identically the same. So that's my expectation, but  
8 if I try to repeat the test, to repeat it precisely  
9 would be a tough thing.

10 That would lead me then to ask the  
11 question, okay, so then you've done some sort of  
12 uncertainty propagation through your measured  
13 variables and you - and the GE folks have said once I  
14 look at one test and I look at the oscillatory  
15 behavior coming out of that test, and the decay ratio,  
16 etcetera, etcetera, within some confidence level I  
17 feel good about what I've measured. That's the other  
18 way of attacking it. That's what I was expecting.

19 MR. INCH: I think that's the right  
20 answer. We've been given from GE the test conditions  
21 to run at. We didn't make these up. These are also  
22 described in the LTR. And in that specification there  
23 is a condition - how close you need to be, what our  
24 uncertainty is.

25 So for example, that two percent within,

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1 you know, close to the rod line, and I think we're  
2 controlling it within one percent on flow, and those  
3 then establish the issue of condition such that it is  
4 repeatable. But are we testing the repeatability?  
5 No, that's not in our plan.

6 MEMBER SCHULTZ: George, one thing that  
7 could help is this afternoon if you could go over the  
8 test matrix and display that, that could perhaps shed  
9 some light on what the range of information is being  
10 established at each of the test points.

11 And secondly, perhaps GE could discuss -  
12 we always see these test matrix, but we never see the  
13 result in terms of the answer to this question. What  
14 variability does one see? Did you get the test  
15 results that you expected? And are there any  
16 confounding uncertainties in the testing that you're  
17 working on?

18 So perhaps if we can address both the  
19 range of test conditions and the matrix, as well as  
20 the results which have been seen in past tests or  
21 expected in this test, it would help.

22 MR. INCH: Okay, it just occurred to me  
23 one thing we are doing is we're - we are repeating the  
24 EPU test that we did in 2012 as one repeat test that  
25 we're going to do. So that is -

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1 MR. KHAN: And at TC 2, and really all of  
2 these tests, I know it doesn't really answer your  
3 question, but they are very similar to the tests that  
4 were performed for extended power upgrade.

5 CHAIR REMPE: So this is some of the areas  
6 for inspection then that is submitted to the NRC which  
7 - before you were - as part of the MELLLA+  
8 implementation? The section 4.4 and the draft SE, is  
9 this what you document and submit to the regulator?

10 MR. INCH: The results of them?

11 CHAIR REMPE: Yes.

12 MR. INCH: Right now the LTR doesn't  
13 require us to submit the results of the tests. It  
14 requires us to perform them and they're available for  
15 audit, but -

16 CHAIR REMPE: But this is the test in the  
17 areas for inspection that you're referring to in  
18 section 4.4, or what is done for 4.4?

19 MR. THOMAS: This is George Thomas.  
20 Because they have done part of testing in the EPU  
21 type, there was not currently any additional testing  
22 requirements actually.

23 So in the Monticello SER, we were silent  
24 about the testing, but they get into some trouble in  
25 the test data. And then the data, they couldn't find

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1 the lead in the SER, so we kept telling something for  
2 the testing in the SER.

3 And because of the testing problem, we  
4 actually put a paragraph telling that, you know, that  
5 that's okay, and if get into trouble, they cannot  
6 really go and implement the MELLLA+ without completing  
7 all of the tests.

8 CHAIR REMPE: So what do you expect them  
9 to do to meet this requirement or this information  
10 here about the full implementation of MELLLA+ with  
11 only partial testing will not be acceptable?

12 MR. THOMAS: We follow that through our  
13 original leads and the regional staff. If they get  
14 into any trouble with any testing, we wanted to make  
15 sure they won't stop MELLLA+.

16 CHAIR REMPE: But, okay, they're saying,  
17 well, it's only open for inspection. We don't have to  
18 submit it to the regional inspectors, and now you're  
19 saying well, they do need to - the regional inspectors  
20 need to look at something. And how will they evaluate  
21 whether it's acceptable or not is what I'm trying to  
22 get to here?

23 MR. SAENZ: This is Diego Saenz. So  
24 they'll have acceptance criteria for these tests and  
25 we expect that if they don't meet their acceptance

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1 criteria, they would follow this with their corrective  
2 action program, and the inspectors follow the  
3 corrective action program.

4 CHAIR REMPE: And what are the acceptance  
5 criteria? Because they've just said, well, we look  
6 for stability. I mean, it does sound like we're  
7 talking about the same tests here, but -

8 MR. INCH: Each one of the tests has  
9 acceptance criteria. So you know, the stability, the  
10 decay ratio is one of the criteria. Moisture  
11 carryover being less than the design limit is a  
12 criteria.

13 The - for APRM noise, one of the tests we  
14 do to make sure that the APRM noise on a higher rod  
15 line is bounded by our calc assumption, that's a  
16 criteria. So each one of these tests has - especially  
17 the dynamic testing has criteria.

18 So for pressure and level it's decay ratio  
19 on pressure and level, the controlled variable. So  
20 that's all in the test plan, test spec from GE, and  
21 incorporated into our test procedures from that. And  
22 then the test procedures and the results are going to  
23 be a formal program test procedure.

24 It will run through our plant operations  
25 review committee for approval, and then any - like you

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1 mentioned, any test criteria failure would then result  
2 in an instant report in IR which would then have to  
3 take corrective action.

4 CHAIR REMPE: So is the phrase about full  
5 implementation still valid? I mean, have they covered  
6 the entire - you guys agree on what's an acceptable  
7 range here of tests to be performing?

8 MR. THOMAS: Yes. No licensee is going to  
9 start the plan without completing all of the tests.  
10 But still, we make sure that MELLLA+ will have a  
11 paragraph like that.

12 MR. INCH: The way we understood the draft  
13 SE was if you're going to operate in the MELLLA+  
14 region you need to complete this test plan, and that's  
15 what the LTR says.

16 And if for some reason we couldn't, we  
17 could only partially complete it, that - we'd be in no  
18 man's land. You'd have to - I think you'd have to  
19 talk to the regulator as to what we could do at that  
20 point.

21 But right now, it's our understanding that  
22 to operate in the MELLLA+ region we need to complete  
23 these tests.

24 MR. GOODNEY: But we wouldn't be operating  
25 there. We'd move back down below the MELLLA line and

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1 that's where we'd stay until it was resolved.

2 CHAIR REMPE: Okay, thank you.

3 MR. INCH: The last thing I wanted to  
4 cover was some OE that - from Monticello that we  
5 looked at. It's the only other plant that's  
6 implemented MELLLA+ at this point. And what they  
7 experienced was an unexpected main steam line high  
8 radiation alarm when they were coming down in flow.

9 And at the reduced core flows you will get  
10 an increased N 16 on main steam line. And when you're  
11 on hydrogen water chemistry, you're injecting hydrogen  
12 in, and depending on what that rate is you can have an  
13 increase that's not necessarily proportional to the  
14 power change depending on how much hydrogen you're  
15 putting in.

16 So we've studied that data and one of the  
17 things that Nine Mile, when we did power operate, we  
18 did run an optimization ramp test on the hydrogen  
19 injection to optimize that rate.

20 And there's basically a knee on the curve  
21 with - when you're implementing noble metals if your  
22 hydrogen injection rate is still meeting the 4 to 1  
23 ratio and you blow the knee, you don't see a large  
24 change in the main steam line dose.

25 So our expectation is that we're going to

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1 be below the alarm. We will be monitoring it as we  
2 come down. So that was the one piece of OE that, you  
3 know, did have some relevance to Nine Mile.

4 So that concludes the open session  
5 discussions that we had planned.

6 MR. CIFONELLI: Mine's next.

7 MR. INCH: Oh, I'm sorry.

8 MR. CIFONELLI: For you.

9 MR. INCH: For me. Dan Cifonelli is going  
10 to go through the -

11 MR. CIFONELLI: Good morning, I'm Dan  
12 Cifonelli. I'm an active senior reactor operator at  
13 Nine Mile Point Unit 2, and a shift manager, and I'm  
14 currently assigned to assist with MELLLA+, along with  
15 I still perform relief functions in the control plan  
16 and shift management.

17 Today I plan to talk about a summary about  
18 technical specification changes, the power to flow map  
19 changes, operator actions, our ATWS strategy, time  
20 critical operator actions, and our training that we've  
21 performed to support the MELLLA+ implementation.

22 This slide provides a high level summary  
23 of the gamut of technical specifications required to  
24 implement MELLLA+. We've already talked about a few  
25 of these.

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1 I want to point out that number two,  
2 particularly with respect to the boron enrichment to  
3 92 percent concentration, has been a really well  
4 received change in the plant that the operators are  
5 experiencing. It significantly slows down the ATWS  
6 event. Our hot shut down boron time has been reduced  
7 from 16.4 minutes to four-and-a-half minutes.

8 So the operators have really grabbed onto  
9 the use of this tool, if you will, and always have  
10 used boron but now they're - it teaches itself for  
11 using it when the operators' promptly inject boron  
12 prior to the automatic operation.

13 They are positively reenforced on the  
14 scenario because they're able to shut the plant down  
15 very quickly avoiding the long term heat addition to  
16 the containment.

17 MEMBER SKILLMAN: I appreciate the  
18 reactivity of the higher boron presence, but I do ask  
19 why an only 8 psig increase in pressure makes a  
20 difference?

21 MR. CIFONELLI: Well, I think George can  
22 answer it better than me. The ATWS analysis, peak  
23 pressure has come up just that amount so we were  
24 required to make the change in our tech spec number  
25 because the heat pressure is slightly higher.

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1 MR. INCH: So you're asking why it was  
2 only 8?

3 MEMBER SKILLMAN: It seems almost  
4 insignificant -

5 MR. INCH: It is.

6 MEMBER SKILLMAN: - in the span of that  
7 pressure.

8 MR. INCH: It is. We agree.

9 MEMBER SCHULTZ: But the change in  
10 pressure is due to an analysis result -

11 MR. INCH: Right.

12 MEMBER SCHULTZ: - associated with the  
13 ATWS event.

14 MR. INCH: Yes.

15 MEMBER SCHULTZ: So you see that and then  
16 the tech spec needs to be changed to match the  
17 analysis.

18 MR. INCH: Right, the - I think - is Craig  
19 - Craig, could you speak to the analysis peak pressure  
20 results that we have? Because the peak pressure of  
21 1372, and we're going to go into proprietary session  
22 I think, is governed primarily by several aspects of  
23 the analysis. Maybe we can get into it later.

24 So, you know, it is a small change, and we  
25 would expect it to be small.

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1 MEMBER SKILLMAN: It appears to me to be  
2 almost cosmetic and just in alignment with analysis.  
3 It seems to have no real practical impact on the rate  
4 at which the boron is injected.

5 MR. INCH: The most important part of it  
6 is, you know, relative to the standby liquid control  
7 pump pressure, and I have a slide on that where small  
8 changes could be important for that. For Nine Mile  
9 it's not so much, but it is - that's why there's a  
10 tech spec change for that.

11 MEMBER SKILLMAN: I'd like to see that  
12 slide at some point.

13 MR. INCH: Okay.

14 MEMBER SKILLMAN: Okay, thank you.

15 MR. CIFONELLI: Item five is the tech spec  
16 requirements for when our OPRM algorithm is inoperable  
17 for an automatic RPS trip. OPRMs are required to be  
18 operable, and if they're not, operations in  
19 restricted.

20 Immediate action is required to implement  
21 the manual backup scram protection, and 12 hours to  
22 implement the automatic backup scram protection, and  
23 a report to the NRC is required within 90 days to  
24 discuss the corrective actions that are scheduled for  
25 completing those.

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1           If the automatic backup scram protection  
2 cannot be implemented, then operations is further  
3 restricted to below the backup's ability protection  
4 boundary line, which is the 50 megawatts per millions  
5 pounds mass per hour line, and it's depicted on the  
6 power-to-flow map on the next slide.

7           The next slide is the power-to-flow map  
8 that is used by operations to maintain the plant  
9 within its required operating domains. We have a  
10 number of procedures that reference this graphic. The  
11 graphic is used by operators for startup, shutdown,  
12 normal activity maneuvers, and response to transient  
13 conditions.

14           The power-to-flow map is two foot by three  
15 foot laminated. The power-to-flow map is not anything  
16 that's new to the operators. It has been redesigned  
17 by the MELLLA+ project team. And in January of this  
18 year we presented it to the operators in a draft form.

19           And the interest was in receiving their  
20 feedback and comments to ensure that the nomenclature,  
21 the color coding, the lines were just the way my  
22 operators wanted to see them in terms of human  
23 factors, to ensure a good assimilation to the new  
24 regions. We kept a lot of familiarity with the colors  
25 and the lines to assure an easy transition to the

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1 MELLLA+ operation.

2 MEMBER SKILLMAN: Dan, let me ask this, in  
3 your operator training, are the operators required to  
4 reproduce this from memory?

5 MR. CIFONELLI: No.

6 MEMBER SKILLMAN: Why?

7 MR. CIFONELLI: There's - I would think  
8 that the complexity of information is not something  
9 that - I don't want my operators to have to memorize  
10 in a transient. I prefer that they refer to the  
11 procedure.

12 MEMBER CORRADINI: They have some sort of  
13 plastic map of this I assume?

14 MR. CIFONELLI: Yeah, this is - there's a  
15 two foot by three foot laminated copy at the front  
16 panel of the control room, and we use marker to mark  
17 and map where we are on the power-to-flow map. There  
18 are some set points on the power-to-flow map that the  
19 operators are familiar with.

20 When we reduce recirc flow to minimum,  
21 they know that means don't reduce recirc flow to less  
22 than 55 million pounds mass per hour, and that's  
23 unchanged, and that is the knee of the curve on the  
24 new MELLLA+ map.

25 So there's no - I wouldn't want my

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1 operators to make an error when they're manipulating  
2 the plant and try to do some of the more complicated  
3 manipulations that we use for the power-to-flow map  
4 from memory.

5 MEMBER CORRADINI: Can I ask about this  
6 because I am trying to compare the two from the next  
7 slide? But the yellow region means if I stray into  
8 the yellow region I have some time window that I have  
9 to get out of the yellow region whereas the red region  
10 is scram?

11 MR. CIFONELLI: That's correct.

12 MEMBER CORRADINI: Okay, and you're  
13 eventually going to get to the next one, but in that  
14 one there's more red, so I'm trying to understand the  
15 difference, and you'll get to that?

16 MR. CIFONELLI: Yes.

17 MEMBER CORRADINI: You've essentially  
18 taken the K region and turned it red, so I'm trying to  
19 understand.

20 MR. CIFONELLI: The yellow exit region in  
21 our normal power-to-flow map is region two, which is  
22 the controlled entry region per the GE analysis.  
23 We've elected to approach that more conservatively and  
24 call it an exit region. So for instance -

25 MEMBER CORRADINI: So if they get

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1 themselves there, they've got to get out?

2 MR. CIFONELLI: If they get themselves  
3 there they have to get out whether the OPRMs are  
4 operable or not, and that's the purpose of this slide  
5 is to show you. One of the purposes is to show you  
6 the conservative implementation that we're using. So  
7 they do have to get out if they're in the exit region.

8 And our normal operating procedures have  
9 that redesign to not get into the region when we're  
10 starting up the plant. For instance, Line Golf is 58  
11 percent rod line. That's our maximum rod line for  
12 upshift of a recirculating pump.

13 It was originally 61 percent and we  
14 dropped it down to 58 percent so that we avoid the  
15 controlled entry region by design but we're training  
16 our operators to not go into that.

17 MEMBER CORRADINI: So what you just said,  
18 just so I get it right, if I take the Golf Line and I  
19 go all the way down to essentially 25 percent flow, if  
20 I was at 58 versus 61, I'd be in the yellow which  
21 would essentially, the way you've described it, you  
22 don't want to be there at all.

23 MR. CIFONELLI: That's sort of correct.

24 MEMBER CORRADINI: That's okay, sort of  
25 correct.

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1 MR. CIFONELLI: Yeah, I wouldn't  
2 necessarily be in the yellow, but I can certainly  
3 assure that my operators will not get in the yellow  
4 when they're performing that plant manipulation -

5 MEMBER CORRADINI: Okay.

6 MR. CIFONELLI: - by restricting the start  
7 of the manipulation to where the 58 percent rod line  
8 intersects with Line Bravo.

9 MEMBER CORRADINI: Okay, thank you.

10 MR. CIFONELLI: Going to the next slide,  
11 so the operators have two power-to-flow maps for dual  
12 operation available to them in the control room and  
13 this is the second one.

14 The difference, as Michael pointed out in  
15 the first, in the second one, is primarily the scram  
16 region which is defined by Line Kilo, K. Line K is  
17 region one of the manual backup stability protection  
18 solution, and if we unintentionally find ourselves in  
19 the red region, the operators perform immediate scram  
20 of the plan.

21 The other difference in this power-to-flow  
22 map is the Line M or Mike, and we've talked about that  
23 a little bit already. That's a tech spec required  
24 line that restricts power above the 50 million pounds,  
25 50 million megawatts per pounds mass, which is called

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1 the backup stability protection line.

2 So if OPRMs are inoperable and within 12  
3 hours we cannot implement the automatic backup  
4 stability protection, then we would also further  
5 restrict ourselves to Line Mike, and we've included  
6 that little sliver in the yellow.

7 This power-to-flow map also has another  
8 graphic for the operators and it's down in the  
9 lefthand corner of the slide. That depicts the  
10 automatic backup stability protection which is used in  
11 the pneumatic power range monitoring system.

12 If the OPRMs are inoperable, the operators  
13 have an off-normal procedure to dial in new set points  
14 for the signal to thermal power scram that would  
15 include that red region that, by the way, bounds the  
16 Kilo line on the manual map, and provides a direct RPS  
17 scram signal if that region were entered.

18 The blue area, just to point out the blue  
19 area on this line, is a buffer zone, if you will.  
20 It's what we call the heightened operator awareness  
21 zone and it serves the purpose of warning the operator  
22 that they are approaching or nearing an exit region.

23 We are allowed to operate in that area,  
24 but my procedures minimize the time that we would want  
25 to park ourselves and stay in that region. And on a

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1 transient if we were approaching that region, it would  
2 warn the operators that they will soon have to take  
3 action if conditions were to further degrade and they  
4 were to find themselves in the yellow exit region.

5 So that's the tool that the operators  
6 currently use. It's very similar to the option three  
7 manual actions. We kept it as similar as possible so  
8 that the operators have familiarity with the same type  
9 of concepts. And our off-normal procedures are  
10 designed around the new power-to-flow map.

11 We also note - one thing also that is good  
12 to note on this map is the - where the OPRMs are  
13 armed. You can see the solid red lines that go  
14 horizontally and vertically. The horizontal line is  
15 at 23 percent power and the vertical line is at 75  
16 percent flow. Those are the set points that arm the  
17 DSS-CD solution RPS cycle.

18 MEMBER CORRADINI: So why isn't it armed  
19 at 85? Maybe I don't appreciate that. Why the 10  
20 percent pull back? Why is it not armed on the  
21 vertical line at 85 versus 75?

22 MR. INCH: Oh, the basis for the 75  
23 percent core flow, I think GE would answer that.

24 MR. CIFONELLI: I just assume that - our  
25 current is 60 percent flow and 30 percent power, so

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1 this is a change. The option three solution has a  
2 similar arming region where your ratio - these guys  
3 can explain better than me.

4 DR. VEDOVI: This is Dr. Juswald Vedovi  
5 from GEH. The starting core basis for the OPRM able  
6 regions has been around 60 percent core flow and 30  
7 percent power.

8 However, those region were subject to  
9 being validated on a cycle specific basis to the  
10 extent where the backup stability protection exit  
11 region will be because it does change from cycle to  
12 cycle.

13 And since the boundaries are in the tech  
14 specs, when we develop the DSS/CD we decided to  
15 increase the region conservatively so that it would  
16 not depend on a cycle specific basis to check and  
17 having expanded and having to add a modification in  
18 the tech spec.

19 MEMBER CORRADINI: So if I can say it  
20 differently, this relieves the burden of every time I  
21 have a cycle, the cycle will change.

22 DR. VEDOVI: Correct.

23 MEMBER CORRADINI: Okay.

24 MEMBER SKILLMAN: Dan, let me ask this,  
25 you've got two maps. Are both maps in front of the

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1 operators at all times?

2 MR. CIFONELLI: Yes, they are.

3 MEMBER SKILLMAN: And how does the  
4 operator know which map he or she is supposed to be  
5 focusing on?

6 MR. CIFONELLI: It's simply on the basis  
7 of the status of the OPRMs. Typically, the OPRMs  
8 inoperable map is not used. The history of having  
9 option three for several years, we've never had to use  
10 the OPRMs are inop map. So the display on the front  
11 panel is primarily the normal display.

12 The operators have the ability to pull out  
13 the other plexiglass and plop it down on the main  
14 control console if OPRMs become inoperable to use it  
15 in that case. The primary map is actually kept and  
16 more prominently displayed to the operators.

17 MEMBER SCHULTZ: Prominently and  
18 permanently displayed it sounds like?

19 MR. CIFONELLI: Correct.

20 MEMBER SCHULTZ: And the other one would  
21 be pulled out and used otherwise?

22 MR. CIFONELLI: That's correct, but it's  
23 right at the controls area.

24 MEMBER SKILLMAN: What I think I'm hearing  
25 you say is only when the OPRMs are inoperable do you

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1 use the other map. For all other times you use the  
2 primary, and the operators are very well aware of the  
3 difference between those two circumstances.

4 MR. CIFONELLI: That's correct.

5 MEMBER SKILLMAN: Thank you.

6 CHAIR REMPE: Dan, even though it's less  
7 efficient, it looks like you have several more slides.  
8 Do people want to take a 15 minute break or just keep  
9 plowing through? Is everyone okay to - okay. Okay,  
10 then just if you guys are okay, we'll keep going,  
11 okay.

12 MR. CIFONELLI: The next slide is a  
13 summary slide of the procedure changes that we've  
14 prepared for readiness for implementation. The  
15 bullets are like emergency, off-normal, and OPRMs  
16 inoperable that we've talked about, and the gamut of  
17 27 procedure changes that the station has prepared for  
18 implementation.

19 The first bullet is the strategy for  
20 lowering level to combat an instability event, and  
21 it's been an operator strategy for ATWS mitigation  
22 since Rev 1 of the EPG/SAGs were introduced, and the  
23 strategy continues today in the MELLLA+ domain.

24 It works and it's the same strategy the  
25 operators have been using for a number of years. So

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1 our emergency operator operating procedures are  
2 unchanged.

3 The next bullet talks about our normal and  
4 abnormal transient procedures. And as I've already  
5 talked about a little bit, the major change is in the  
6 definition of the regions which we navigate through  
7 and maintain ourselves in the operating domain, and  
8 the references in those procedures and the  
9 power-to-flow maps to different lines on the  
10 power-to-flow map that have been redefined for MELLLA+  
11 operation.

12 So conceptually for the operators there is  
13 not a complex change for them. It's an understanding  
14 of - Line Kilo had moved a little bit and Line Lima  
15 has moved a little bit on the power-to-flow map.

16 The MELLLA line is a straight line whereas  
17 the MELLLA+ region has a 55 percent flow if you go  
18 back to the flow map. You see at 55 percent flow it  
19 has the vertical line into it. So for instance, our  
20 rapid power reduction procedure restricts rapid power  
21 reduction using recirc flow to prevent entry again  
22 into the yellow region.

23 So if we were to have a loss of a feed  
24 water pump online, and we usually have two feed water  
25 pumps running in operation, if a feed water pump were

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1 to trip, currently I can come all the way down - I'm  
2 sorry, let me back up a little bit, not if it trips.

3 If I want to put the plant in a place to  
4 set myself up for a rapid removal of a feed water  
5 pump, currently I could pump to the place I need to be  
6 which is approximately 68 percent power using recirc  
7 flow alone.

8 Now I'll be limited to 55 percent flow,  
9 and then the operators are directed to insert scram  
10 rods to go around the knee of the curve, if you will,  
11 and then lower flow further to get to 68 percent power  
12 if necessary for rapid removal of a feed water pump.  
13 So that's an example of how we've changed some of our  
14 off-normal procedures.

15 The third bullet we've talked about which  
16 is the operator actions for when OPRMs would become  
17 inoperable, and the fourth bullet just represents the  
18 total procedures that have changed.

19 The procedures that have changed are  
20 operational, reactor engineering, and instrumentation  
21 and control procedures for set point changes. Again,  
22 there are 27 procedure changes and they're all ready  
23 to go.

24 MEMBER SKILLMAN: How have the operators  
25 been trained on the changes?

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1 MR. CIFONELLI: I have a couple of slides.  
2 The next slide provides a little bit more detail of  
3 the standard contingency five that the EPGs practice  
4 for ATWS scenarios. There are three level bands that  
5 are generally used in the contingency in an ATWS  
6 condition. The first level band is very broad. It  
7 spans from -39 to 202.3, and those are our plant  
8 specific numbers.

9 What they are the - -39 is the minimum  
10 steam cooling water level where adequate core cooling  
11 is accomplished by both submergence and steam cooling,  
12 and the top of the band is the turbine trip and the  
13 feed pump trip set point.

14 So when power is less than four percent or  
15 down the scale, the guidelines for an ATWS mitigation  
16 is to allow a large level band. In that case, there  
17 is not enough driving force of power to create an  
18 instability of a wide variety.

19 I'd say the more band of interest for  
20 MELLLA+ operation is the middle band. The middle band  
21 is specifically designed for thermal hydraulic  
22 prevention, and it lowers level below the feed water  
23 sparger which allows preheating of the feed water and  
24 reduces subcooling, and subsequently reduces the  
25 reactivity addition by subcooling the water.

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1           This band spans from the minimum steam  
2           cooling water level up to two feet below the feed  
3           water sparger. The typical order that the senior  
4           reactor operator gives when he's in the ATWS event  
5           will be name Dan or whoever, "Lower water level to  
6           less than 100 inches." When level drops below - I'm  
7           sorry, it says terminate and prevent injection when  
8           level is below 100 inches, major level band 50 to 80  
9           inches.

10           50 to 80 inches is a scripted band we use  
11           in our transient mitigation guidelines, and it allows  
12           margin to the sparger on the top end, and on the  
13           bottom end it allows margin to main steam line level  
14           one isolation.

15           In parallel, the operators are doing  
16           numerous other things, controlling pressure using -  
17           generally using SRVs, defeating the high pressure core  
18           spray pump from injecting because that's not allowed  
19           in an ATWS, high-powered ATWS event, taking actions to  
20           defeat the level one main steam line isolations,  
21           injecting standby liquid control, and lowering water  
22           level.

23           This band is given in the Charlie 5  
24           contingency procedure with the - by the senior reactor  
25           operator, and the reactor operator would use good

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1 three-way communications before he takes action to  
2 lower water level in the reactor.

3 The third band is if things get worse and  
4 we're adding heat to the containment. In this case  
5 APRMs are still upscale, and since we're adding heat  
6 to the containment, we will reach our boron injection  
7 initiation temperature which is 110 degrees at Nine  
8 Mile Point Unit 2.

9 So if we were to get to 110 degrees in the  
10 suppression pool, levels would lower further to the  
11 top of active fuel down to the main steam - the  
12 minimum steam cooling water level, and this is to  
13 drive power low to prevent further challenging of the  
14 containment, and we're here controlling level at the  
15 top of active fuel essentially.

16 So that's our level control strategy in a  
17 variety of ATWS situations, including the couple that  
18 were evaluated in MELLLA+.

19 The next slide is the gift that I got from  
20 MELLLA+, two new time critical operator actions. The  
21 two were already presented by George. They are 20  
22 seconds to place a manual scram in case of an ATWS,  
23 particularly the duel recirc mode trip.

24 And the second is the 270 seconds to get  
25 to that step where we say terminate and prevent

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1 injection, and the operator uses a flow controller to  
2 close the feed water regulation valves.

3 The actions were validated in September of  
4 2014 per the Exelon procedure for time validation of  
5 critical actions. It's a fairly rigorous procedure  
6 that a team was assembled to design the validation  
7 process.

8 And I used natural operating crews in a  
9 training cycle. Four crews were time validated. And  
10 we also did some sensitivity with regards to minimum  
11 staffing. We observed the crews performing these  
12 actions in a minimum staffing level.

13 The results were that the timing is not  
14 affected by minimum staffing, and this is because  
15 they're high priority actions. They're taken from the  
16 front panels of the control room and they're single  
17 switch type actions. So the staffing levels had no  
18 impact on the data.

19 MEMBER SKILLMAN: Dan, the 20 seconds to  
20 use the mode switch has, as I interpreted them, an  
21 important connotation. You can do a manual scram by  
22 hitting your scram button, but when you use the mode  
23 switch, you are actually enacting a number of other  
24 processes. Is that what you're trying to communicate  
25 here?

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1 MR. CIFONELLI: No. I'll say yes and no.  
2 Let me try to answer that fully.

3 MEMBER SKILLMAN: The mode switch does  
4 more than just scram the plant.

5 MR. CIFONELLI: Correct.

6 MEMBER SKILLMAN: It opens up a whole  
7 bunch of other logic.

8 MR. CIFONELLI: We want to use the mode  
9 switch. That's the way we've been doing it since the  
10 plant start up, doing that, scrambling the plant as the  
11 initial. We want to put the system in a shutdown  
12 configuration. So those other things that happen are  
13 good things for a shutdown plant.

14 For instance, they defeat the main steam  
15 line closure on low pressure. So the mode switch is  
16 the best way to initiate a scram, a manual scram. The  
17 push buttons for RPS are also available to the  
18 operator, and they're an initial contingency action if  
19 the mode switch fails to insert a manual scram.

20 The mode switch has a set of contacts that  
21 are tech spec required manual scram contacts, so the  
22 mode switch in a shutdown position does input to the  
23 RPS circuitry a manual scram.

24 MEMBER SKILLMAN: Thank you, I was just  
25 confirmed that that's what you meant. I got it.

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1 Thank you.

2 MR. CIFONELLI: Okay, the next slide is  
3 the results of our validation process. The 20 second  
4 requirement we met with a significant margin. 8.5  
5 seconds was the average time with a span of five to 16  
6 seconds. The 270 second time, we came in at 71.5  
7 percent with an average time of 193 seconds with a  
8 span of 150 to 232 seconds.

9 The operators were not given any special  
10 training to do this. This is their current  
11 proficiency, if you will. I didn't hoist them up and  
12 we didn't give them any new goals to reach. We didn't  
13 give them any new expectations. This is an action  
14 that has been instilled in our operators for a number  
15 of years.

16 Previous to MELLLA+ we did not have it as  
17 a time critical operator action. MELLLA+, the  
18 analysis requires a time critical action, so we  
19 included it into our program, and we found that it's  
20 achievable under our current proficiency.

21 The validation reports were submitted on  
22 the docket to NRC, and the NRC audit also confirmed  
23 the proficiency of the operators to perform these  
24 actions.

25 CHAIR REMPE: So that was in November,

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1 right? And what kind of times did they get during the  
2 audit? Was it close to the average? Was it -

3 MR. CIFONELLI: I don't have those times.  
4 They were less than 270 seconds.

5 CHAIR REMPE: Okay.

6 MR. CIFONELLI: The next -

7 DR. MARCH-LEUBA: We're asking around here  
8 in the staff - Jose March-Lueba, Oak Ridge - and we  
9 don't remember the numbers, but certainly including  
10 the most region to shutdowns really fast. The typical  
11 response time is four to seven seconds for that. I've  
12 timed that one before. Now the long term, I don't  
13 remember.

14 CHAIR REMPE: Thank you.

15 MR. CIFONELLI: The next slide's purpose  
16 is to show the maintenance of these times. The  
17 program, Exelon program for managing time critical  
18 operations are consistent with regulatory guidance.  
19 The two biggest processes that could affect a time  
20 critical action are a design change or a procedure  
21 change.

22 And waxed into the processes are  
23 checklists that require you to address time critical  
24 actions. So both engineering and procedure writers  
25 are required to look at all time critical actions when

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1 they're making a change, and we revalidate every five  
2 years all time critical actions.

3 The next couple of slides is a summary of  
4 our operator training. We, early in the process, we  
5 assigned an operator, qualified operator trainer to  
6 the project to help us, and he's here today, and he's  
7 done an excellent job helping to get our operators  
8 prepared.

9 We started about a year ago and introduced  
10 the MELLLA+ concept. We had - we brought Juswald up  
11 and he helped with the DSS/CD solution, and our  
12 operators were trained on the new algorithm. And we  
13 went over thoroughly the proposed technical  
14 specification changes.

15 Then again in August 2014, we started our  
16 simulator testing where we exposed the operators more  
17 to the power-to-flow maps and the ATWS scenarios  
18 starting at limiting points on the MELLLA+ line, 100  
19 percent power, 85 percent flow, and exercised the ATWS  
20 contingencies in the MELLLA+ region for a variety of  
21 initiating events. That was the same time frame that  
22 I used for the validation of the time critical  
23 operator actions.

24 We also reemphasized and provided the  
25 operators with a demonstration of 92 percent atom-rich

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1 boron. We started from 100 percent power and just  
2 turned the boron on and watched how quickly the plant  
3 shuts down.

4 And my final slide is more on training.  
5 In January of this year we did some reenforcement  
6 training. We provided the engineered power-to-flow  
7 maps to the operators and did ask for their feedback.  
8 We exercised more abnormal procedures.

9 We exercised procedures for a feed pump  
10 trip or a recirc pump trip. So those are some of the  
11 more, let's say, challenging scenarios for the  
12 operators and currently and in MELLLA+. And we did  
13 note that there was very little difference in the  
14 operator actions required to respond to those type of  
15 events.

16 And we went over tech specs more  
17 thoroughly. Mike provided a number of cases for the  
18 operators to study for "what if." What if we were in  
19 this condition, what tech spec would you be in? What  
20 would you be required to do? And we went through a  
21 variety of scenarios with regard to tech spec  
22 implementation.

23 And then in May of this year we took  
24 advantage of a recent industry event and reenforced  
25 some fundamentals. The fundamentals that we were

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1       reenforcing were the importance of prompt insertion of  
2       control rods when they're in the active region.

3               We also went over the effects of  
4       subcooling on the reactor core and the potential for  
5       instabilities if you delay actions. And we also  
6       emphasized the procedures required for recognition of  
7       any oscillations and the operator actions required  
8       which is immediate scram if an operator were to  
9       observe an instability, which is observable if they're  
10      in phase.

11              It's a slower moving oscillation and not  
12      quite so observable if it's out of phase. You'll see  
13      some LPRMs going upscale and downscale, but quickly  
14      moving oscillation would be suppressed by the RPS  
15      signal.

16              And the only thing we have planned going  
17      forward is just in time training for our testing  
18      program. And we will also do some reenforcement  
19      requal training. All of the initial training is  
20      complete. We are ready for MELLLA+ implementation.

21              MELLLA+ will eliminate the burden of  
22      operators frequently manipulating control rods to  
23      maintain power which will reduce the probability of  
24      control rod manipulation error and related  
25      consequences such as a fuel failure. This will be an

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1 improvement in operational safety.

2 MELLLA+ will allow operations to maintain  
3 additional margin to our rod line limitations and  
4 eliminate the current requirement to operate near rod  
5 line limits. This will also be an improvement in  
6 operational safety.

7 Based on the training given, the  
8 procedures and controls available, and the validation  
9 of the operator actions, Nine Mile Point licensed  
10 operators are ready to implement MELLLA+.

11 CHAIR REMPE: Thank you. So at this point  
12 let's do the public comments. So can someone check  
13 about the lines and open it up?

14 MR. CLOSE: Sorry, we just wanted to  
15 follow up on one point of information that Mr.  
16 Corradini asked about concerning rate of power descent  
17 and power ascension. This is Bob Close from Nuclear  
18 Fuels.

19 And typical for Nine Mill 2, BWR 5, is  
20 that when down powering to do a rod pull or  
21 significant maneuver, they down power to about a half  
22 a percent a minute. And if you would, reducing power  
23 to like 30 or 35 percent to perform the maneuver  
24 typically takes an hour, maybe an hour-and-a-half.

25 Power ascension is a different matter for

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1 the reasons mentioned by the team. You get into your  
2 preconditioning of the fuel, right, and once you're  
3 into - reached preconditioning ramp rates, and there  
4 are ramp rates that apply for different fuel for  
5 different situations, those rates of increase would  
6 come down to two to two-and-a-half percent per hour,  
7 all right, of increase.

8 So nice and gentle on the way back up once  
9 they reach their preconditioned rates. But in  
10 general, power descension is, if you would, in a  
11 controlled fashion they can come down pretty quickly.  
12 All right, so just wanted to follow up on that  
13 question. Back to you.

14 CHAIR REMPE: Okay, so now I've been told  
15 the lines are open, and the only way we can verify  
16 that is if someone who is out there will say something  
17 to verify it. And given the fact that no one is  
18 saying anything, I'm going to assume that there's no  
19 one out there, but I'll check real quick. Is there  
20 anyone in the audience who wishes to say anything?

21 PARTICIPANT: Is the line open?

22 CHAIR REMPE: Oh, that's good. Thank you  
23 for verifying that. Okay, is there anyone out there  
24 who wishes to make a public comment? Okay, so with  
25 that, what we're going to do is take a 15-minute

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1 break. There are 12 slides I guess for the closed  
2 licensee session, and so I would like to go ahead and  
3 push, and even if we have a bit late of a lunch, and  
4 come back here in 15 minutes, so at 11:20, and then  
5 we'll start up with the closed session, okay? Thank  
6 you.

7 (Whereupon, the above-entitled matter went  
8 off the record at 11:06 a.m.)

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# **Opening Remarks**

**Travis Tate**

**Acting Deputy Director**

**Division of Operation Reactor Licensing**

**Office of Nuclear Reactor Regulation**



# **Introduction**

**Bhalchandra Vaidya**

**Project Manager**

**Division of Operation Reactor Licensing  
Office of Nuclear Reactor Regulation**



# Review Timeline

- November 1, 2013 – MELLLA+ application submitted to NRC
- Acceptance Review completed with Supplemental Information from the Licensee on January 21, 2014. Additional Supplemental Information Received on February 25, 2014.
- Revised Application Dated June 13, 2014, to reflect the completion of Implementation of changes related to Standby Liquid Control System received.
- Biweekly FR Notices Re: No Significant Hazard Determination published on June 6, 2014 and August 5, 2014.
- Multiple rounds of RAIs Issued to Licensee on the topics of Reactor Systems, Instrumentation & Controls, Human Factors, etc. Licensee responses received between March 10, 2014 to February 20, 2015.
- The NRC staff performed audit at NMP-2 on Nov 20, 2014



# Licensing Actions Related to MELLLA+ Amendment

The licensee's existing license condition and the proposed technical specification changes support the MELLLA+ Application

- Proposed technical Specification change for TS LCO 3.4.1 prohibits single loop operation in MELLLA+ domain
- Existing license Condition 7 restricts Feedwater Heater out of Service by imposing a 20°F FW temperature band

# **Nine Mile Point Nuclear Station – Unit 2**

## **Maximum Extended Load Line Limit Analysis Plus**

**Advisory Committee on Reactor Safeguards  
Power Uprate Subcommittee Meeting  
June 22, 2015**



**Exelon Generation®**



# Nine Mile Point Nuclear Station – Unit 2

MELLLA+

*Maximum Extended Load Line Limit Analysis Plus*

# **Nine Mile Point Nuclear Station – Unit 2**

## **Maximum Extended Load Line Limit Analysis Plus**

**Advisory Committee on Reactor Safeguards  
Power Uprate Subcommittee Meeting  
June 22, 2015**



**Exelon Generation®**

# Introduction

Mohamed Khan

*Engineering Manager, Exelon  
Nine Mile Point Nuclear Station*



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## Licensee Presenters

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- Mohamed Khan      Engineering Manager      Exelon/NMP
- Dale Goodney      Senior Project Manager      Exelon/NMP
- George Inch      Senior Staff Engineer      Exelon/NMP
- Daniel Cifonelli      Operations Shift Manager      Exelon/NMP

# Licensee Participants

---

- Robert Close      Nuclear Fuels      Exelon/NMP
- Ken Kristensen      Regulatory Assurance      Exelon/NMP
- Mike Smith      Operations Training      Exelon/NMP
- James Tusar      Nuclear Fuels      Exelon Corp.
- Ronnie Reynolds      Licensing      Exelon Corp.
- Bruce Hagemeyer      MELLLA+ Project Manager      GEH
- Larry King      Project Manager      GEH
- Juswald Vedovi      Stability      GEH
- Craig Goodson      ATWS-I      GEH

# Agenda

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- NMP2 Station Overview *Mohamed Khan*
- MELLLA+ Project Overview *Dale Goodney*
- MELLLA+ Design and Analyses *George Inch*
- Operator Procedures and Training *Dan Cifonelli*

# NMP2 Station Overview

Mohamed Khan



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## NMP2 Station Overview

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- General Electric BWR-5
- Mark II Containment
- Began commercial operation in 1988
- 24 month operating cycle
- All GE 14 Fuel Type
- Electric motor-driven feedwater pumps
- Reactor recirculation flow control valves (2 loops)
- Licensed for Increased Core Flow (ICF)
- Redundant Reactivity Control System (RRCS)

## NMP2 History

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Key Milestones	Year	Megawatt - Thermal (MWt)
➤ Full Power Operating License (Original Licensed Thermal Power - OLTP)	1987	3,323
➤ Stretch Power Uprate (104.3% OLTP)	1995	3,467
➤ Option III Stability Solution	2000	3,467
➤ Renewed Operating License	2006	3,467
➤ MELLLA Operating Domain	2008	3,467
➤ Extended Power Uprate (120% OLTP) (Current Licensed Thermal Power - CLTP)	2012	3,988

# MELLLA+ Project Overview

Dale Goodney



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## MELLLA+ Licensing

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- MELLLA+ License Amendment Request includes:
  - Expanded operating domain
  - DSS-CD thermal-hydraulic stability solution
  - Increase Safety Limit Minimum Critical Power Ratio (SLMCPR)
  - Associated Technical Specification changes
- No other pending license applications related to NMP2 MELLLA+ project



## MELLLA+ Licensing Timeline

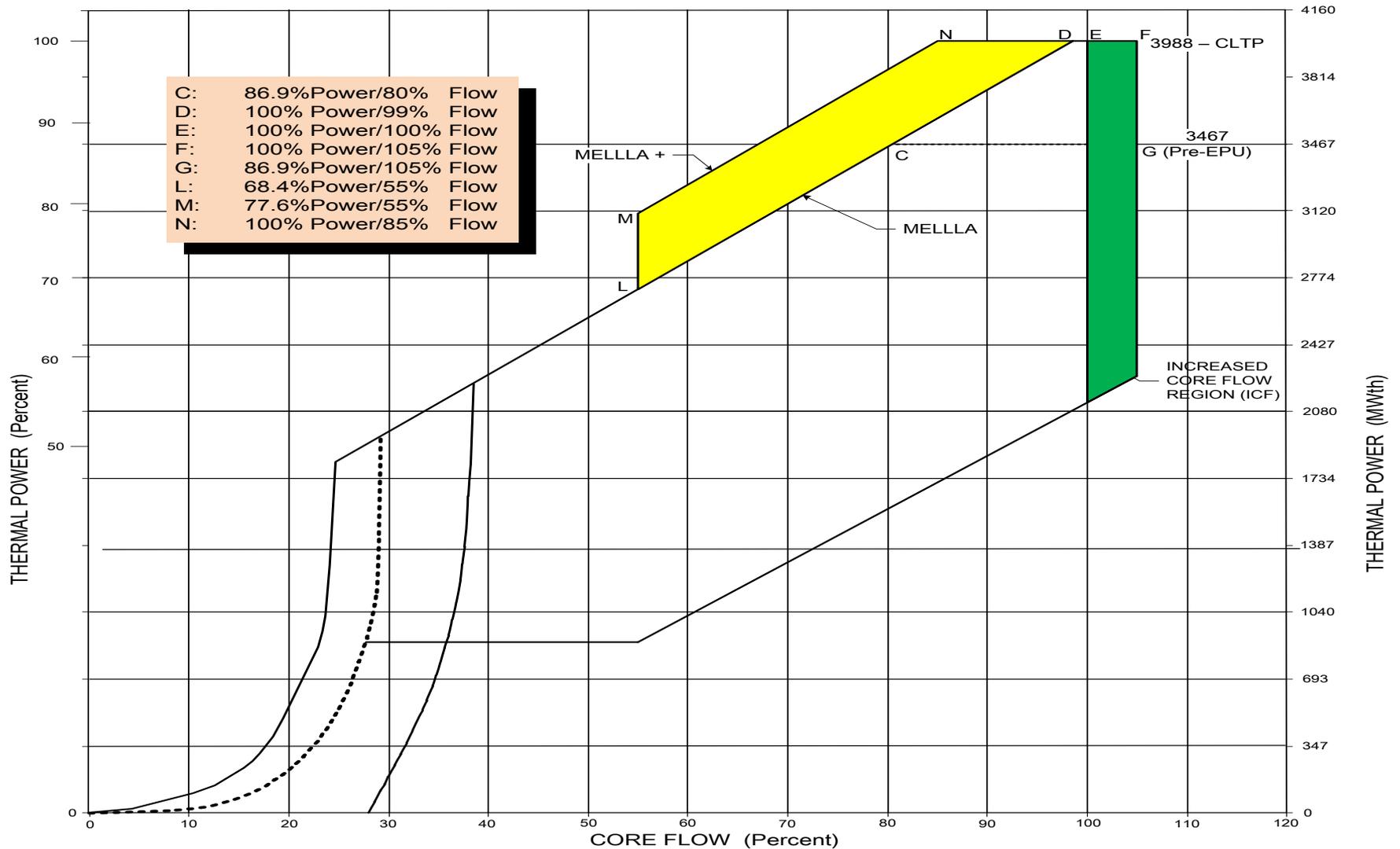
Key Milestones	Date
➤ Pre-Application Meetings	February/March 2013
➤ MELLLA+ License Amendment Request (LAR) Submittal	November 2013
➤ NRC Acceptance Review	January 2014
➤ MELLLA+ LAR Fuels Supplement	February 2014
➤ MELLLA+ LAR Revision 01	June 2014
➤ NMP2 ATWS Simulator Audit	November 2014
➤ Draft NRC MELLLA+ Safety Evaluation Report	May 2015
➤ ACRS Subcommittee	June 2015
➤ ACRS Full Committee	July 2015 (planned)
➤ Receive MELLLA+ LA	August 2015 (planned)
➤ Implement MELLLA+ LA	September 2015 (planned)

## MELLLA+ Benefits

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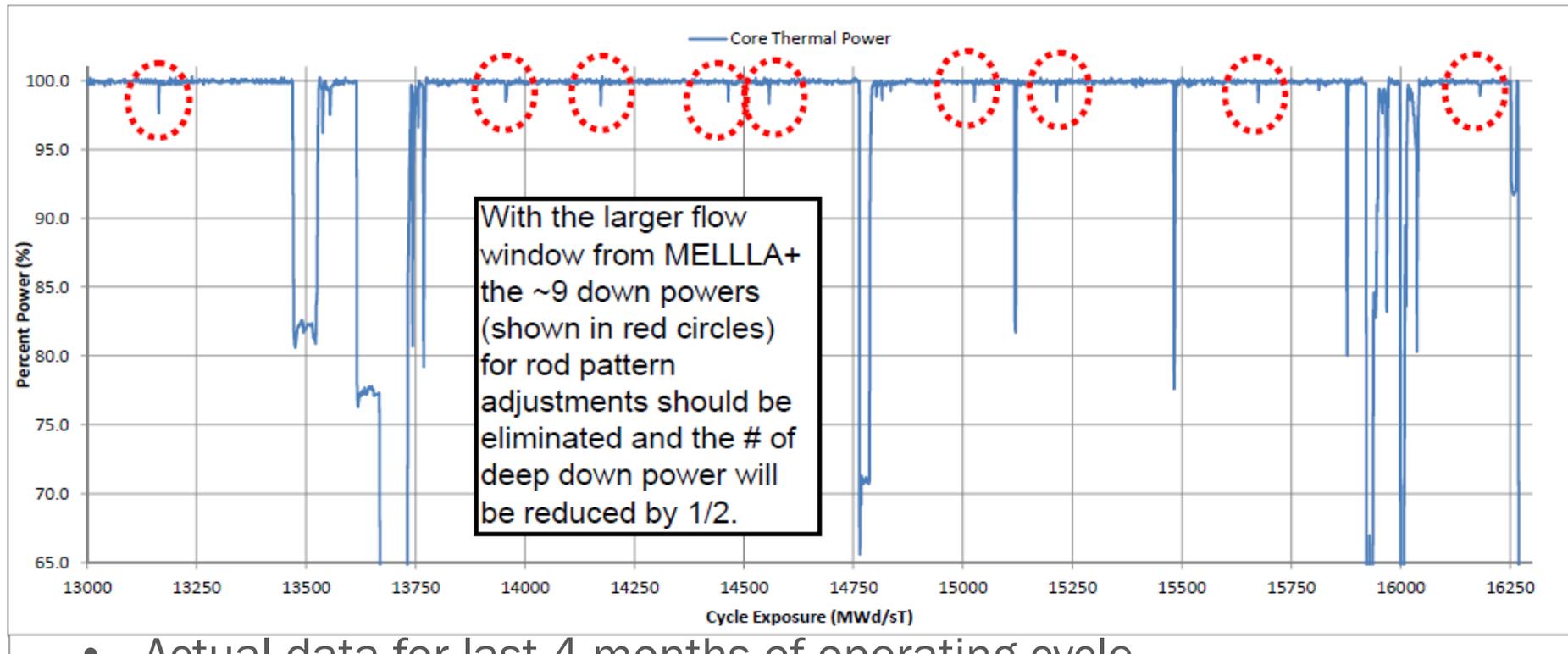
- Expands core flow window at 100% power by ~14% of rated flow
  - Provides greater operational flexibility
  - Eliminates control rod manipulations to compensate for reactivity changes and maintain 100% power
  - Fewer End of Cycle deep down powers for rod pattern adjustments

# MELLLA+ Benefits - Power/Flow Map



## MELLLA+ Benefits

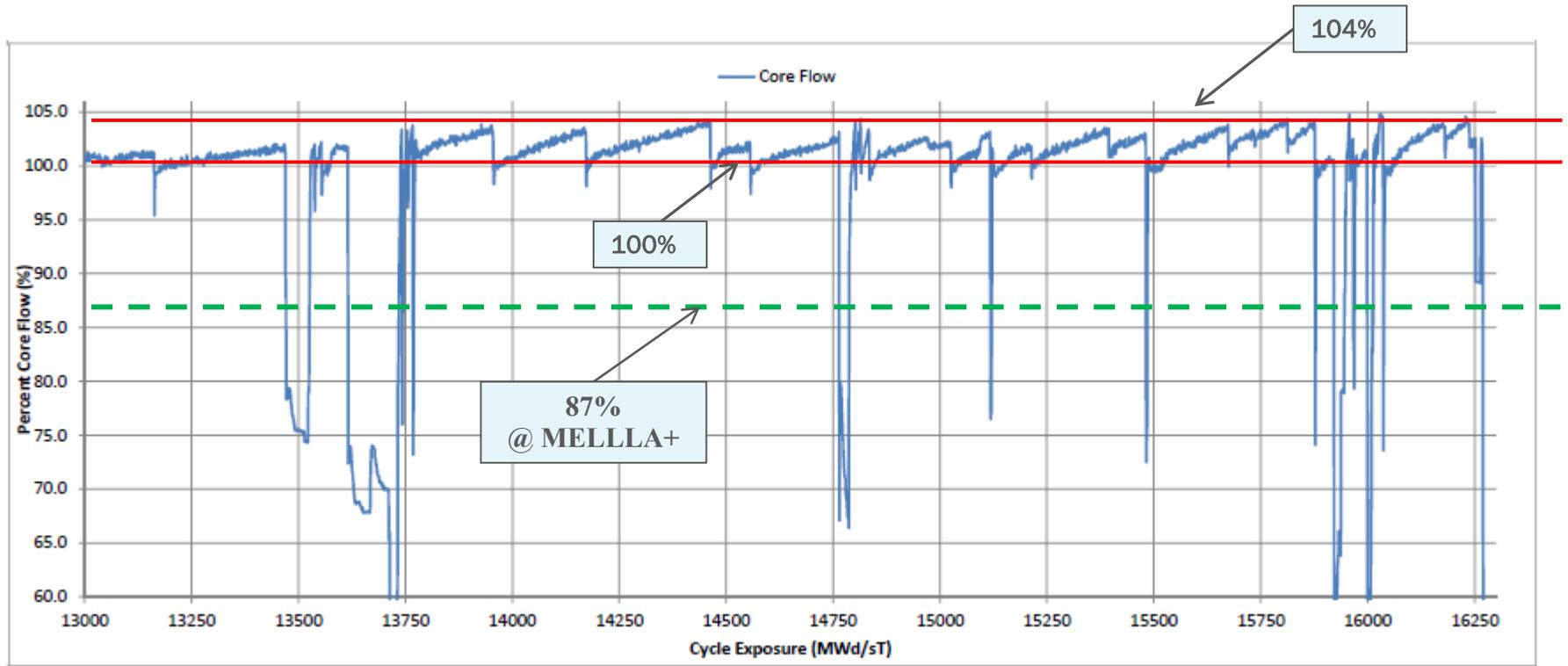
### Near End of Cycle Down Powers – First Extended Power Uprate (EPU)/MELLLA Operating Cycle



- Actual data for last 4 months of operating cycle
- Small down powers (to 98% CLTP) will be eliminated
- Rod withdrawal deep down powers (65% to 80% CLTP) will be reduced by 50%

# MELLLA+ Benefits

## Near End of Cycle Core Flow – First EPU/MELLLA Operating Cycle



- Minimum operating core flow will be ~87% to maintain 2% margin to the MELLLA+ rod line

## MELLLA+ Project Scope

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- MELLLA+ does not change:
  - Operating Pressure
  - Maximum Licensed Thermal Power
  - Maximum Licensed Core Flow
  - Feedwater Flow Rate or Temperature
- MELLLA+ does not require modifications to balance of plant equipment



# MELLLA+ Project Scope

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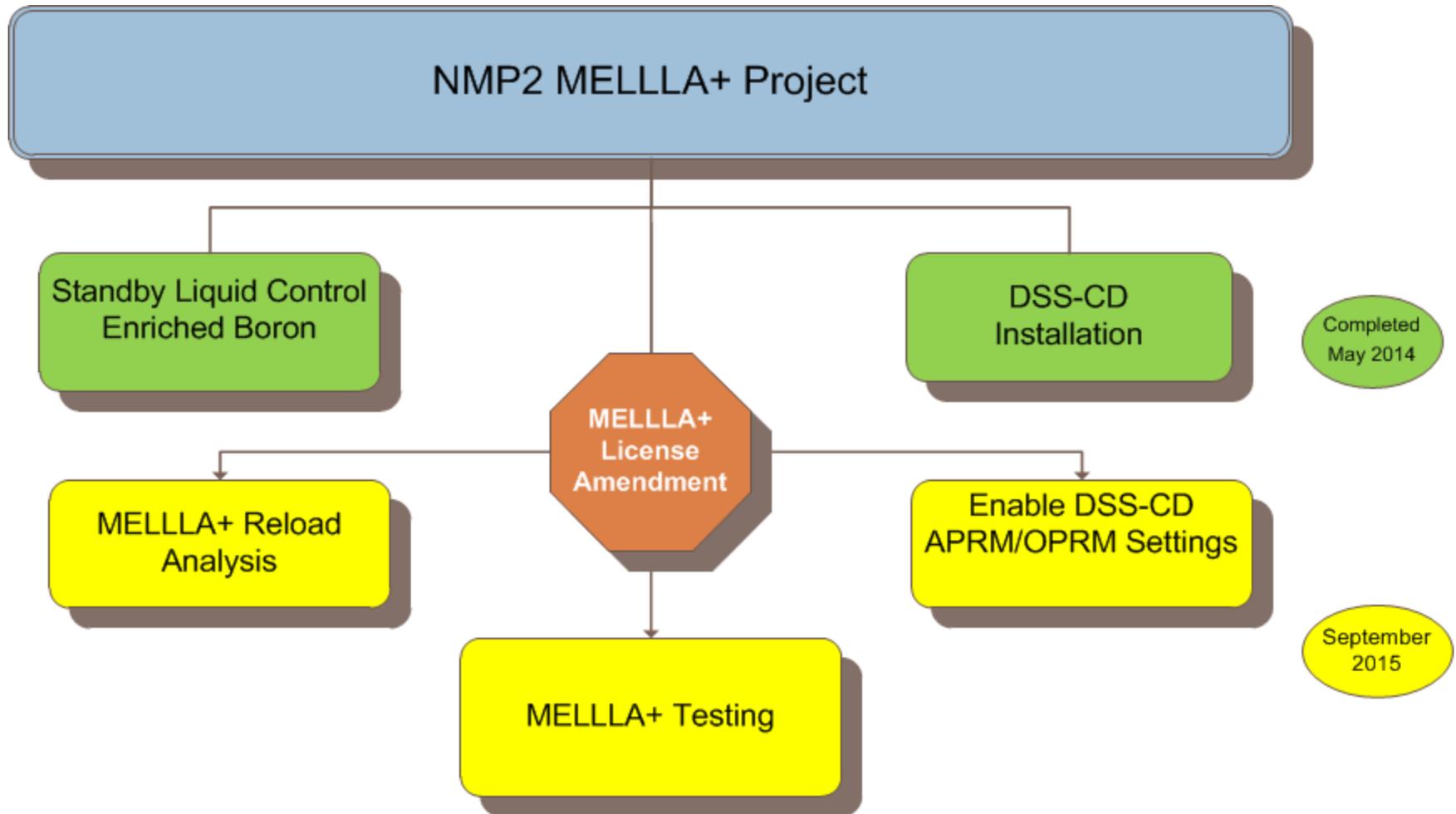
- MELLLA+ project scope includes:
  - Revised Power/Flow Map
  - DSS-CD stability solution and associated Oscillation Power Range Monitor (OPRM) settings
  - Standby Liquid Control System margin improvement
  - New APRM settings
  - MELLLA+ Reload Analysis

## MELLLA+ Implementation

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- Installation and test activities are governed by the station design change and work control processes
- Implementation will occur on-line within 90 days after MELLLA+ License Amendment approval
- MELLLA+ implementation is in two phases:
  - 2014 - Outage-related plant modifications (Complete)
  - 2015 (September) - On-line installation/TS implementation/Testing

# MELLLA+ Implementation



# Enable DSS-CD

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- **Remove CDA Bypass Jumpers**
  - One APRM logic module at a time:
    - Enter LCO
    - RPS test device installed to prevent ½ scrams
    - Remove physical jumper (2 per APRM channel)
    - Perform Channel Functional Test
    - Exit LCO
- **OPRM Setting Changes**
  - Bypass one APRM channel at a time
  - Install settings and test Channel 1 and 3 OPRM (Inop, enter LCO))
  - Implement TS (Channel 2 and 4 Inop)
  - Install settings and test Channel 2 and 4 OPRM (Exit LCO)

# MELLLA+ Design and Analyses

George Inch



**Exelon** Generation®

# NMP2 MELLLA+ Design and Analysis Overview

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- Key Features of the NMP2 MELLLA+ LAR:
  - Design and Analysis credits Boron-10 92 atom % to maintain margin to (HCTL High Containment Temperature Limit) as per MELLLA+ LTR L&C 12.18b.
    - Improves Margin to HCTL compared to Stretch and EPU conditions by reducing impact on suppression pool temperature
    - Increases Standby Liquid system pump redundancy
  - Design and Analysis credit NMP2 Redundant Reactivity Control System (RRCS) design attributes for automatic injection of Standby Liquid control System (SLS) and automatic feedwater flow runback
    - Minimizes operator action response time requirements to mitigate ATWS for MELLLA+

# NMP2 MELLLA+ Design and Analysis Overview

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- NMP2 EPU Core Flow Operating Margins
- NMP2 EPU Moisture Carryover (MCO) Operating Experience
- NMP2 MELLLA+ MCO Assessment
- DSS-CD
- MELLLA+ SRLR
- NMP2 RRCS design and Operator Actions for ATWS
- ATWS ODYN Licensing Basis Analysis
- NMP2 Standby Liquid Control System Margin Improvement
- MELLLA+ Implementation Test Plan
- Monticello MELLLA+ Operating Experience
  
- ATWS ODYN Licensing Basis Analysis (with Supplement Proprietary information)
- ATWS with Core Instability TTWBP and Dual Recirculation pump trip (Proprietary Information)

# NMP2 EPU Core Flow Operating Margin

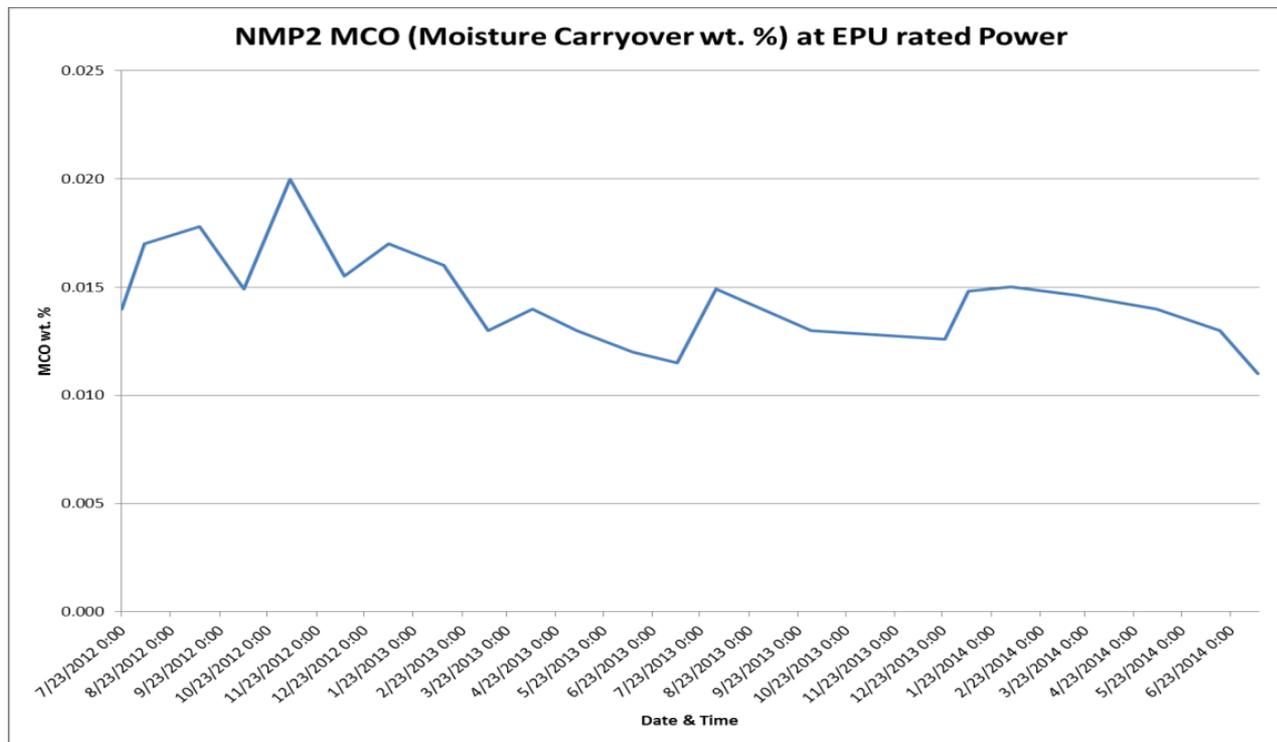
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M+ objective is to recover the pre-EPU 20% core flow operating margin which includes the increased core flow region (100% to 105%)

- To operate at EPU power the MELLLA boundary requires core flow greater than 99% rated
- For EPU NMP2 installed anti-fouling JP mixers to restore original JP performance to achieve the maximum design rated JP performance capability at EPU of 103.9% core flow capability
  - The maximum rated core flow achieved at max flow control valve (FCV) position for the limiting core exposure cycle power shape is between 103 to 103.5%
  - 105% core flow achievable at End-of-Cycle (EOC) conditions and during Beginning-of-Cycle (BOC) conditions
  - The practical core flow operating window at EPU rated conditions is from 100% to 102.5%.
    - Operational margin to the MELLLA boundary at 99%
    - Maximum FCV position only used at EOC conditions

# NMP2 EPU MCO Operating Experience

- Actual EPU operating Main Steam Moisture Carryover (MCO) remained essentially unchanged from Pre-EPU power level measured MCO
  - Average EPU MCO is well below predictions
  - NMP2 EPU core design results in flat radial peaking which equalizes steam separator loading. The EPU/MELLLA+ transition core has similar characteristics



## MELLLA+ MCO Assessment

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- MELLLA+ can impact MCO depending on MELLLA+ limiting operating conditions.
- MCO above the functional design performance specification of 0.1 wt% is predicted
  - Anticipated to occur less than 5% of the time based on equilibrium core projections
  - The maximum calculated MCO for MELLLA+ was 0.236 wt% for a limiting radial peaking rod pattern versus EPU predicted maximum of 0.125 wt% for a limiting radial peaking rod pattern for the M+ fuel cycle
- Radiological impact analyzed for MCO increase up to 0.35 wt%
- Flow Accelerated Corrosion (FAC) CHECWORKSTM model for EPU assumes steady-state MCO of 0.25 wt% Therefore, the FAC evaluation performed for EPU remains bounding for MELLLA+
- The limiting components are the MSIV's which restrict the maximum MCO to less than 0.25 wt%.
- MELLLA+ implementation includes monitoring the MCO at multiple points in the MELLLA+ region.

# Long-Term Stability Solution (DSS-CD)

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- The DSS-CD solution is designed to identify the power oscillation upon inception and initiate control rod insertion to terminate the oscillations prior to any significant amplitude growth.
- DSS-CD will replace currently licensed Option III using PRNMS – OPRM
  - The existing Option III algorithms are retained to provide defense-in-depth protection for unanticipated reactor instability events.
- Confirmation Density Algorithm (CDA) protects SLMCPR in the entire licensed power/flow map, including MELLLA+ conditions
- DSS-CD analysis for NMP2 performed in accordance with the approved DSS-CD LTR, with no deviations
- NMP2 has upgraded PRNMS hardware to include DSS-CD for M+
  - When OPRM system is inoperable ABSP will be utilized
  - When both OPRM and ABSP are inoperable Manual BSP will be utilized
  - When manual BSP cannot be implemented reduce power to < 18% RTP

## Experience

- 15 years with Option III on PRNMS hardware
- > 1 year of operating history with PRNMS using DSS-CD in background

# MELLLA+ SRLR

MELLLA+ Supplemental Reload Licensing Report (SRLR) submitted to NRC February 25, 2014 as supplemental information to MELLLA+ Licensing Amendment Request

- Reload analysis based on currently operating C15 core design.
- Minor thermal limit increase reflects SLMCPR adder for Two Loop Operation (TLO) and small changes to limiting transients for MELLLA+
- Two Loop Operation Safety Limit increases from 1.07 to 1.09
- No impact on Linear Heat Generation Rate (LHGR), Maximum Average Planar Linear Heat Generation Rate (MAPLHGR) limits

Licensing Basis	LTR SER L&C	EPU Cycle 14 SLMCPR Adder	MELLLA+ Cycle 15 SLMCPR Adder
EPU / MELLLA (PUSAR)	9.4 (Methods)	0.02	0.00
Off-Rated CF Uncertainty	12.6 (M+)	N/A	0.03
EPU / MELLLA+ with >42 MWt/Mlbm/hr	9.5 (Methods)	N/A	0.02

Adders assumed at the start of Cycle14 based on NEDC-33173P-A Revision 3,

Start of Cycle15 based on NEDC-33173P-A Revision 4.

- NMP2 Power Density
- @ EPU 3988 MWt 58.99 kW/l, 43.3 MWt/Mlbm/hr Maximum P/F at point M = 51.86 MWt/Mlbm/hr

# NMP2 Redundant Reactivity Control System

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The NMP2 Redundant Reactivity Control System (RRCS) system includes two important Automatic features important for ATWS with Core Instability (ATWS-I) considerations:

- Automatic SLS pump start on Hi reactor pressure (1095 psig, T.S.  $\leq$  1080 psig, nominal 1065 psig) with APRMs not downscale ( $>4\%$ )
  - Nominal delay setting 98 seconds (RRCS has digital timers with minimal setpoint drift)
  - Analysis assumes 120 second initiation delay
- Automatic feedwater runback on Hi reactor pressure 1095 psig, T.S.  $\leq$  1080 psig, nominal 1065 psig) with APRMs not downscale ( $>4\%$ )
  - Nominal delay setting 25 seconds
  - Analysis assumes 33 second initiation delay
  - Runback from 100% to 0% in 21 seconds and automatically open FW pump minimum flow.

Operator actions required for Dual Recirculation pump trip where Hi reactor pressure is not reached

- Assumes Operator action to initiate a manual scram within 20 seconds
- Assumes Operator action within 270 seconds to initiate FW runback

## Licensing Basis ODYN ATWS Analysis

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- NMP2 has automatic SLS injection and automatic feedwater runback features credited in the licensing basis ATWS analysis for EPU and MELLLA+
- The limiting event for reactor peak pressure is the PRFO event. Peak pressure and PCT essentially unchanged from EPU/ MELLLA
- The Peak upper shroud plenum pressure (SLS pump discharge) is essentially unchanged from EPU/MELLLA because the pressure is largely a function of SRV setpoint pressure which is unchanged.
- Time to Hot shutdown reduced compared to EPU/MELLLA

# Standby Liquid Control System Margin Improvement

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Enriched boron-10 significantly improves operator margin for managing HCTL and reactor depressurization.

- MELLLA+SER Limitation and condition requires best estimate TRACG ATWS Analysis because hot shutdown is not reached prior to reaching HCTL
- MELLLA+ SER Limitation and Condition 12.18.b allows elimination of best estimate TRACG ATWS analysis based on the use of enriched boron-10 to reduce the integrated heat load to the containment such that it does not change with respect to the licensing ODYN reference OLTP/75 percent flow.
  - Peak Suppression pool reduced from EPU/MELLLA and remains essentially unchanged from OLTP/ 75 percent flow
  - Peak containment pressure reduced from 7.0 psig (EPU) to 6.5 psig. The design limit is 45 psig

Note: With normal suppression pool level and initial temperatures realistic simulator scenarios show hot shutdown achieved prior to reaching HCTL.

# Standby Liquid Control System Margin Improvement

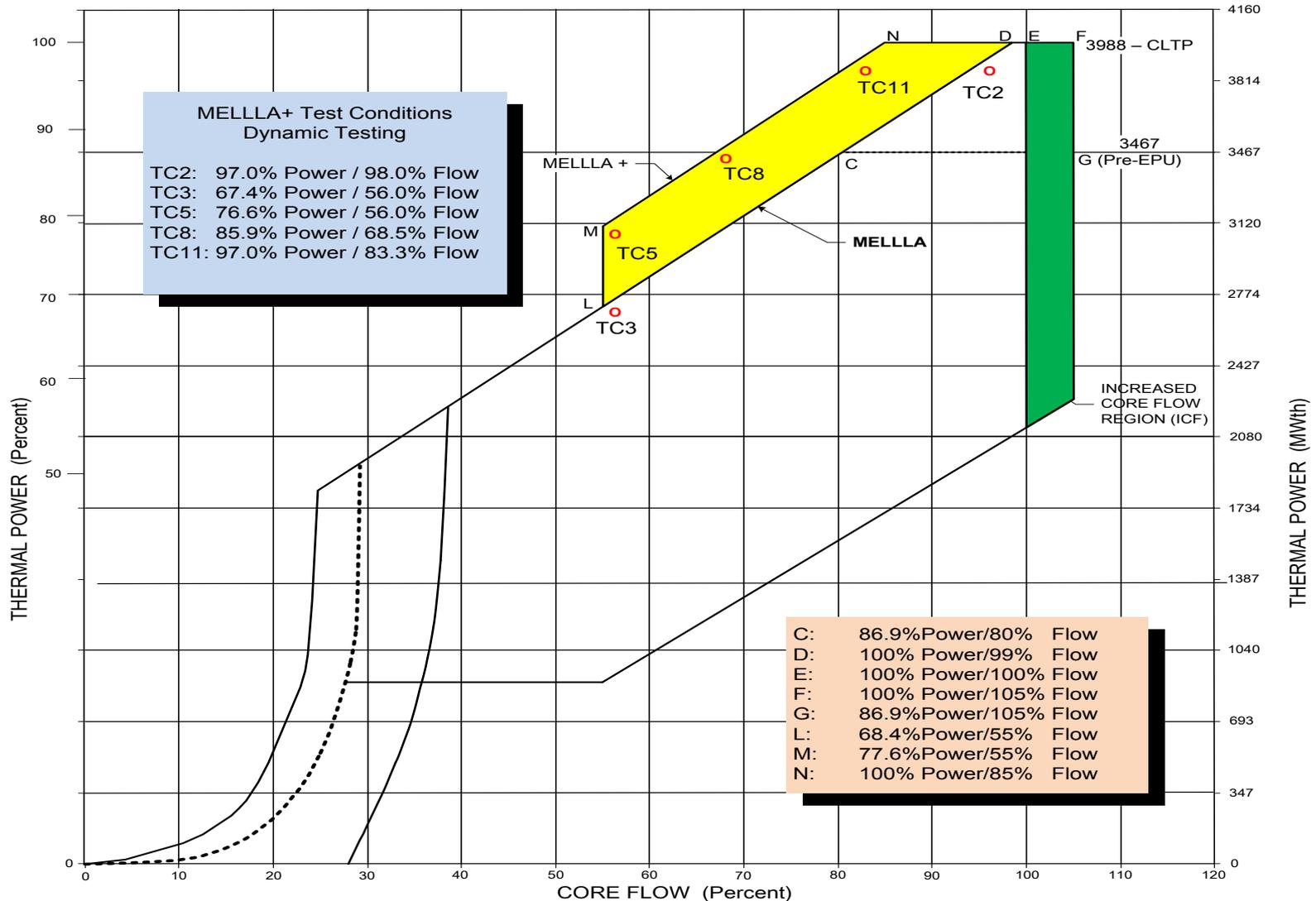
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- With the Boron-10 92 atom %, NMP2 can meet the boron equivalent control capacity requirement of 10 CFR 50.62(c)(4) by utilizing the flow rate of a single SLS pump.
- Entering the flow rate for a single SLS pump (40 gpm) into the applicable equation from the NRC-approved licensing topical report NEDE-31096P-A yields 2.26, demonstrating that a single pump meets the equivalent control capacity requirement.
- Supplemental analyses for all NMP2 licensing basis transients based on single SLS pump flow rate demonstrates NMP2 meets all ATWS licensing basis criteria.

# MELLLA+ Implementation Test Matrix

Test Condition (TC) →	TC 1	TC 2	TC 3	TC 4	TC 5	TC 6	TC 7	TC 8	TC 9	TC 10	TC 11	TC 12
Description	Point D	2% (P & F) Offset from Point D	Point L	Point (L+M)/2	Point M	90% Pre-EPU	95% Pre-EPU	100% Pre-EPU	105% Pre-EPU	110% Pre-EPU	2% Power Offset from Point N	Point N
Power (MWth)	3988.0	3908.2	2727.8	2911.2	3094.7	3120.3	3293.7	3467.0	3640.4	3813.7	3908.2	3988.0
Power (%)	100.0	98.0	68.4	73.0	77.6	78.2	82.6	86.9	91.3	95.6	98.0	100.0
Flow (%)	99.0	97.0	55.0	55.0	55.0	55.8	61.7	67.5	73.3	79.1	82.3	85.0
Rod Line (%)	100.66	99.99	100.69	107.46	114.23	114.10	113.16	112.44	111.91	111.54	111.39	111.30
Test 1B - Steam Dryer/Separator Performance	X		X		X			X		X		X
Test 19 - Core Performance	X		X	X	X			X		X		X
Test 22 - Pressure Regulator (Recirc. System in MANUAL)		X	X		X			X			X	
Test 23A - Water level Setpoint Change (Recirc. System in MANUAL)		X	X		X			X			X	
Test 99A - Neutron Flux Noise Surveillance			X		X							X
Test 99B - TIP Power Distribution												X
Test 99C - Stability Monitor Performance	X		X		X			X				X
Test 101 - Plant Parameter Monitoring & Evaluation (includes Rad Monitoring)	X		X		X			X		X		X

# MELLLA+ Dynamic Test Conditions



## MELLLA+ Operating Experience

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- Monticello MELLLA+ OPEX identified unexpected MSL high radiation alarm associated with MELLLA+
  - Increases in main steam line dose rates related to reactor coolant hydrogen increases at rated power with reduced core flow are expected
  - Operating at hydrogen injection rates near or above a threshold level can result in higher MSL dose increases than experienced pre EPU
- NMP2 uses Online Noble Metals and has implemented post EPU hydrogen ramp testing to optimize the hydrogen injection rate to maintain the 4:1 Boiling Water Reactor Vessel Integrity Program (BWRVIP) recommended ratio for the upper core shroud location
- Optimized hydrogen injection has resulted in reduced main steam radiation below the threshold level
  - MELLLA+ related change in main steam radiation levels anticipated to remain below the alarm setpoint.
  - Monitoring of MSL radiation levels will confirm expected response

# MELLLA+ Operator Procedures and Training

**Dan Cifonelli**



**Exelon Generation.**

# Technical Specification Changes Summary

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1. TS 2.1.1: MCPR Safety Limit from  $\geq 1.07$  to  $\geq 1.09$  for Two Loop Operation
2. TS 3.1.7: Increased SLS Pump required Discharge Pressure from 1327psig to 1335 psig. [B-10 enrichment from  $\geq 25$  atom% to  $\geq 92$  atom% (note no reduction in concentration, 13.6 wt% to 14.4 wt% remains) License Amendment No. 143, approved March 14, 2014]
3. TS 3.3.1.1: RPS OPRM Scram changed from Option III to DSS-CD Solution
4. TS 3.3.1.1: RPS APRM STP Trip changed from  $\leq 0.55W+60.5\%$  and  $\leq 115.5\%$  to  $\leq 0.61W+63.4\%$  and  $\leq 115.5\%$
5. TS 3.3.1.1: RPS OPRM Inoperable Actions added ABSP and Manual BSP
6. TS 3.4.1: Single Loop Operation prohibited in MELLLA/MELLLA+ domain
7. TS 5.6.5: Require COLR to include cycle specific Region I and Region II, ABSP Region and BSP Boundary
8. TS 5.6.8: 90 day reporting requirement for OPRM Inoperability

# Normal OPRM Operable P/F Map MELLA+ with DSS-CD

MELLA+ P/F Maps were developed considering Operator experience, human factors and conservatism to manage change and assure operator success. Draft P/F Maps introduced to all Licensed Operators early (August 2014) in a training setting to solicit feedback, several specific improvements were incorporated.

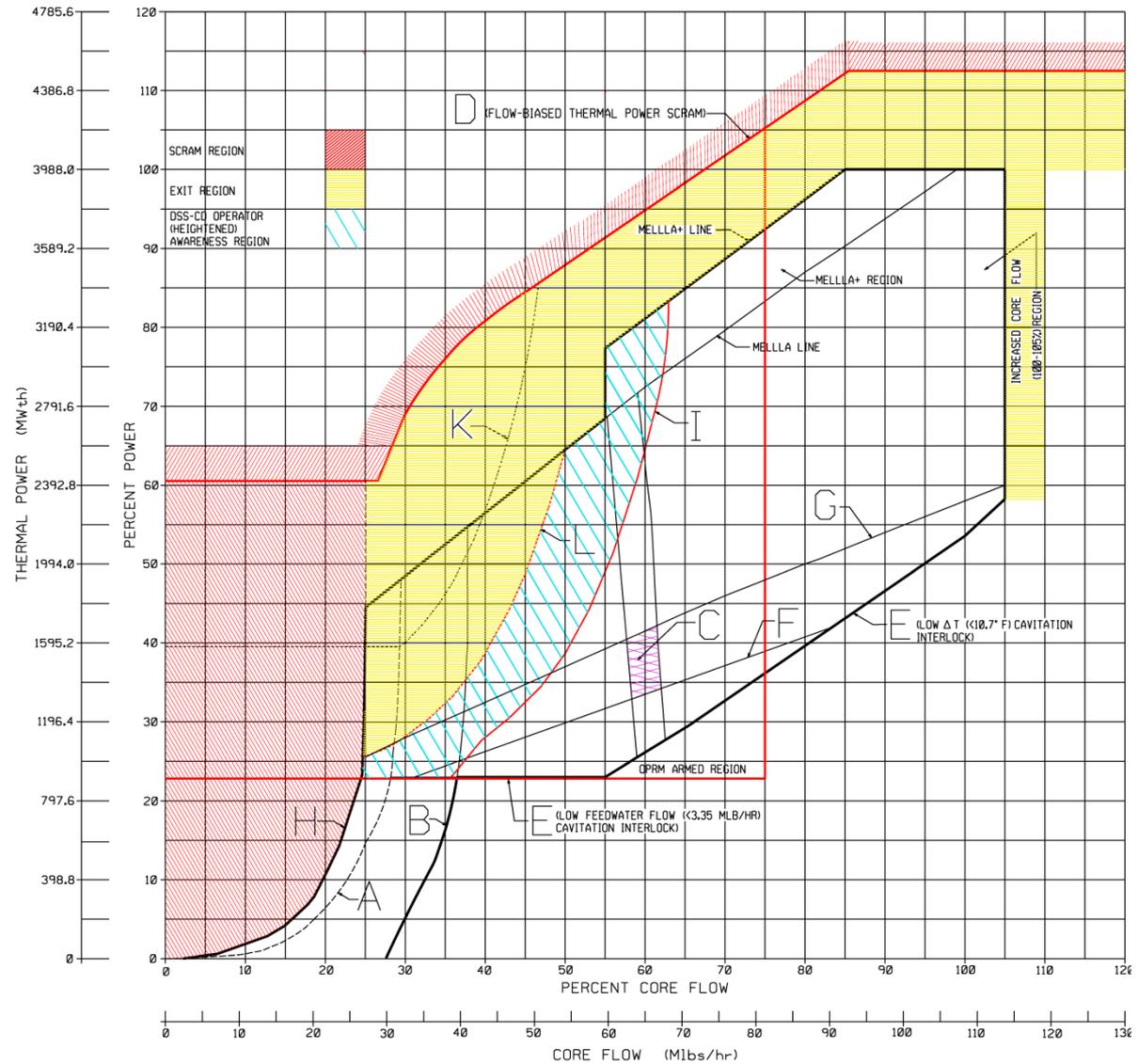
Maintained Operator familiar terminology such as “Exit Region”

Maintained similarity in visual clues (color coding, line designations, etc.)

Eliminated irrelevant information where possible

Clarified notations

Created additional maps for condition if OPRMs were to become INOPERABLE



# Use of P/F Map for Back-up Stability Protection

P/F Maps with Operating Procedures will be used to implement Technical Specifications required (COLR verified) ABSP and Manual BSP.

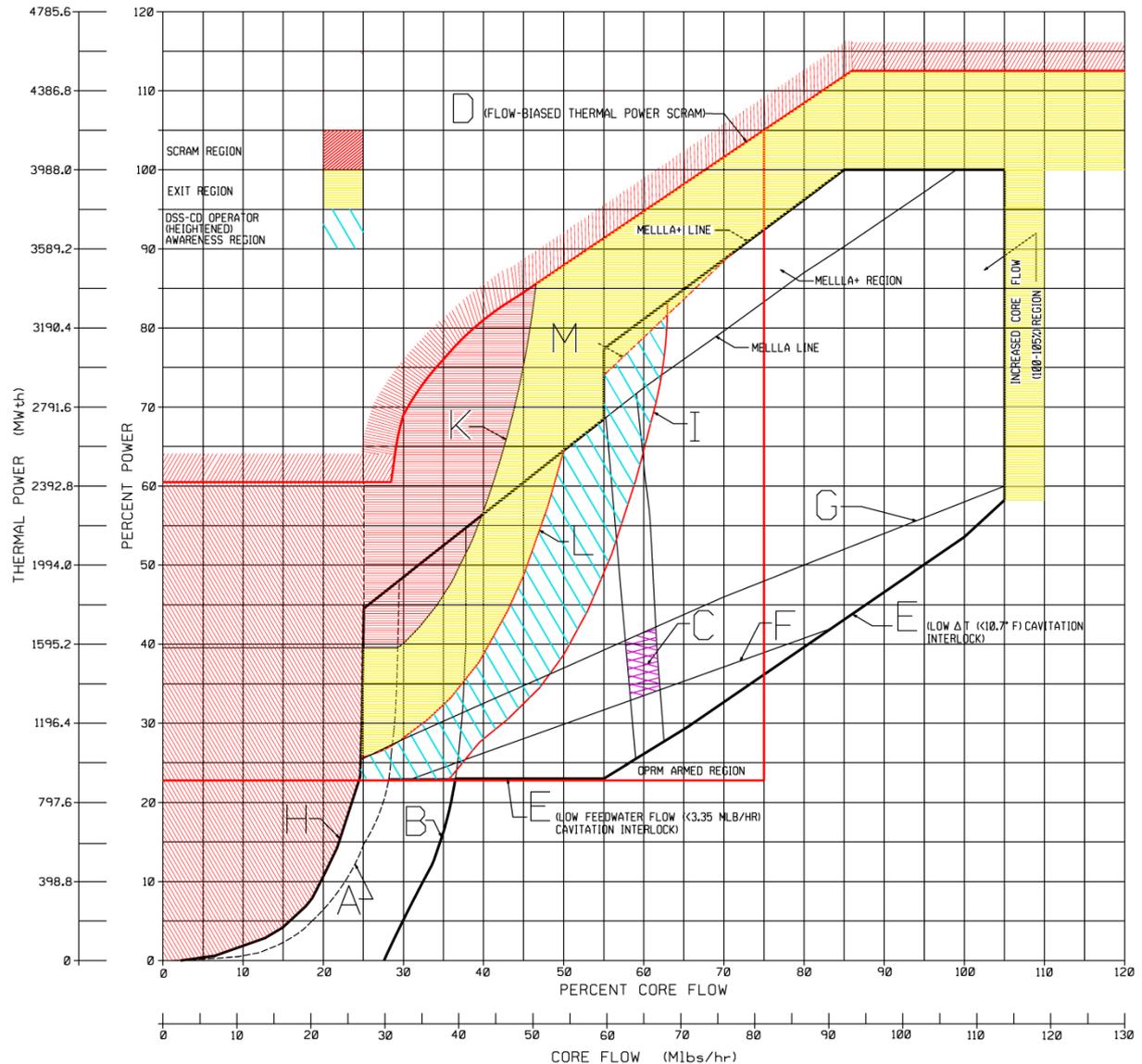
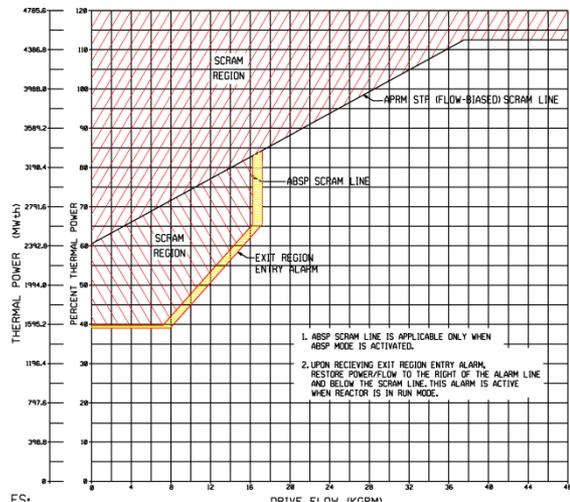
Automatic Backup Stability Protection drive flow figure

Manual BSP Scram Region (Region I) Line K (app same as ABSP)

Manual BSP Controlled Entry Region (Region II) Line L

BSP Boundary Line M

Operator (Heightened) Awareness Region Line I



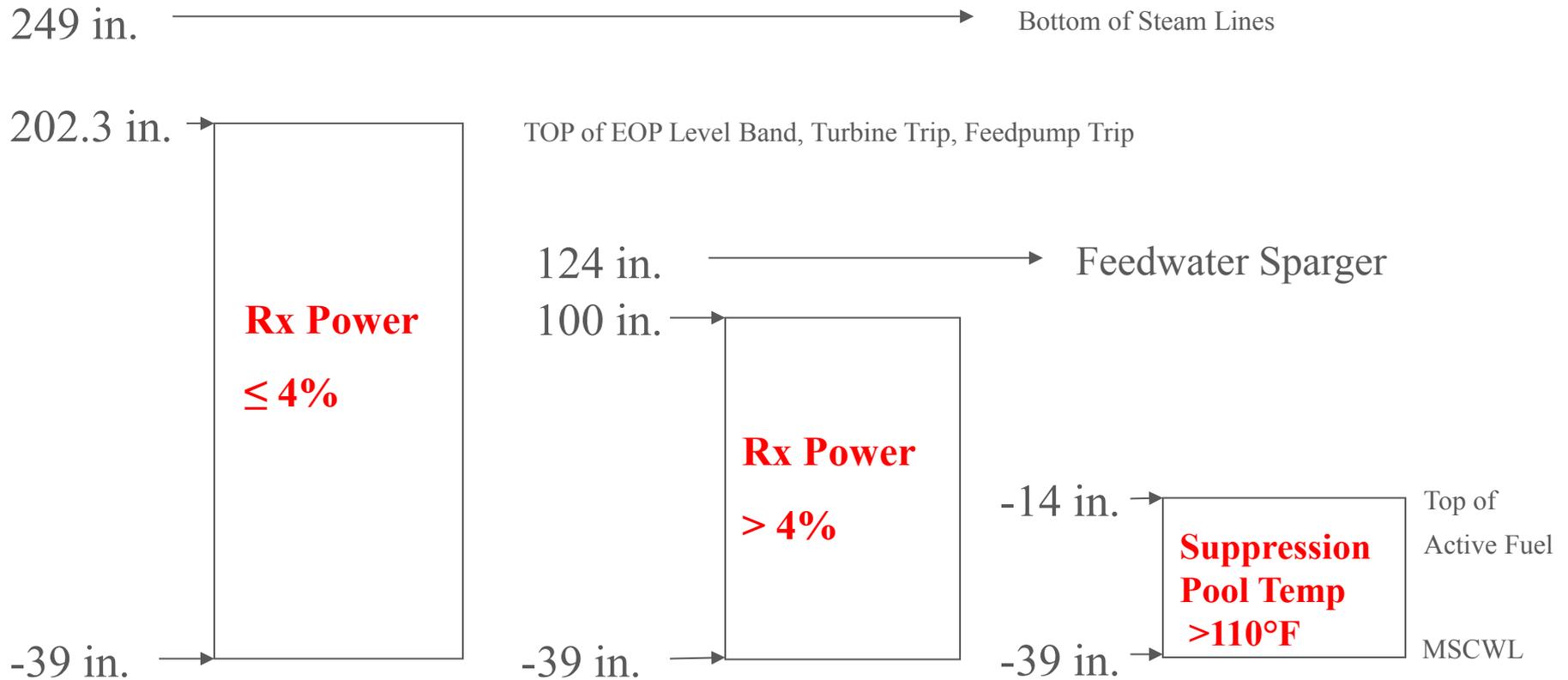
# Operator Procedures

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- NMP2 Emergency Operating Procedures ATWS mitigation contingency has included the strategy of lowering reactor vessel water level to below the feedwater sparger to mitigate thermal hydraulic oscillations since circa 1998 with implementation of Emergency Procedure Guidelines/Severe Accident Guidelines EPG/SAG Rev 1.
- With OPRMs OPERABLE, normal, abnormal and transient Operator Actions are unchanged but the regions on the P/F map where they are implemented have changed.
- With OPRMs INOPERABLE, Operator Actions are governed by Technical Specifications (and COLR) and implemented by Operating Procedures and the P/F Map).
- Procedure changes required for MELLLA+ implementation have been prepared.

# EOP-C5 Level Control

- The Senior Reactor Operator (SRO) works thru C5 and directs the Reactor Operator (RO) to Terminate and Prevent Injection. The RO Repeats back order. SRO closes the three way communication.
- The scripted order is “Terminate and Prevent injection, when level drops to less than 100 inches, make your level band 50 to 80 inches”.



# Time Critical Operator Actions & Validation

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Two ATWS-I Mitigating Strategy Operator Actions have been re-classified as Time Critical Operator Actions.

1. 20 seconds insert a Manual Scram using the Mode Switch  
- Provides additional Scram signal and bypasses the low pressure MSIV Isolation
2. 270 seconds to Terminate and Prevent injection in a dual Recirc Pump Trip  
- Step L-9 in N2-EOP-C5, Mitigates power oscillations to a PCT of 912 °F

These actions times were validated in September 2014 per OP-AA-102-106, Operator Response Time Program.

1. A validation team including Engineers, Qualified Simulator and Operations Instructor, Shift Manager, and four active on-shift operating crews during a 5-week training cycle
2. The crews performed each action (Scram, Terminate and Prevent Injection into the Reactor Vessel (T/P)) while controlled by Qualified Instructor and Observed by Validation Team Members (time data captured by simulator computer and observers using watches)
3. Five scenarios were used for Scram data, one (Dual Recirc Pump Trip) used for T/P data gathering
4. Validation included minimum staffing review to test sensitivity of time to reduced staff. Reduced staffing had no measurable impact on times due to procedural priority, operator knowledge/proficiency, simplicity of tasks and action performance requires one operator.

# Time Critical Operator Actions & Validation Results

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## Validation Results

1. Time Action 1: 5 to 16 seconds with an average of 8.5 seconds
  - Average Time is 43% of Required Time (20 seconds)
2. Time Action 2: 150 to 232 seconds with an average of 193 seconds
  - Average Time was 71.5% of Required Time (270 seconds)
3. Required recognition instrumentation, controls manipulated and operator actions can be performed in front panels of the Control Room by a single operator.
4. Actions are controlled by formal procedures.
5. Demonstrated times have significant margin to required times, which account for uncertainties, stress, event recognition, action planning, team communication and verification practices.
6. Validation reports were submitted to the NRC post Simulator Audit.

Actions are consistent with current Operator training, knowledge and proficiency. No procedure changes or training changes are needed to assure actions are met. The importance of timely reduction of reactor vessel water level to below the feedwater sparger to reduce subcooling and mitigate oscillations in an ATWS, has been and is reinforced during Licensed Operator training.

# Time Critical Operator Actions Maintenance

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- Actions are maintained by Design and Operations per OP-AA-102-106, Operator Response Time Program and OP-NM-102-106, Operator Response Time Program at Nine Mile Point.
- Engineering is responsible for identifying and resolving potential design changes that could impact Time Critical Operator Actions.
- Operations is responsible for identifying and resolving potential procedure changes that could impact Time Critical Operator Actions.
- Operations with the assistance of Operations Training is responsible for re-validation of Time Critical Operator Actions every 5 years.

# Operator Training

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- **June 2014 Initial Classroom Training**
  1. Introduction to MELLLA+
  2. DSS-CD algorithm overview
  3. Proposed Changes to the Technical Specifications
  
- **August 2014 Initial Simulator Training**
  1. Proposed Power to Flow Map (actively solicited Operator feedback)
  2. Demonstration of impact of 92% atom-enriched Boron-10
  3. Time Critical Operator Actions Review and practice
  4. Five ATWS scenarios at 100% power, 85% flow (Maximum MELLLA+ Conditions)  
(Simulator was validated to MELLLA+ TRACG Model prior to training)
    1. Dual Recirc Pump Trip ATWS
    2. LOOP ATWS
    3. MSIV Closure ATWS
    4. Turbine Trip without Bypass ATWS
    5. PRF ATWS

# Operator Training

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- **January 2015 Classroom Reinforcement**
  1. Power to Flow Map
  2. New Abnormal Procedures changes
  3. Technical Specification scenarios (what would you do if)
- **May 2015 Reviewed Industry Instability Operating Experience**
  1. Emphasis on inserting Control Rods
  2. Emphasis on impact of sub-cooling changes to core stability
  3. Emphasis on recognition of oscillations and Operator Action if detected (i.e. Scram)
- **(Scheduled) July 2015 Simulator**
  1. Overview of implementation and testing program (Specific Crews will receive additional Just In-Time Training (JITT))

# End of Open Session



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