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NUCLEAR REGULATORY COMMISSION

Title: Advisory Committee on Reactor Safeguards
Power Uprates Subcommittee: Open Session

Docket Number: (n/a)

Location: Rockville, Maryland

Date: Tuesday, March 17, 2015

Work Order No.: NRC-1450 Pages 1-127

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NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

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POWER UPRATES SUBCOMMITTEE

OPEN SESSION

+ + + + +

TUESDAY

MARCH 17, 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 10:00 a.m., Joy Rempe, Chairwoman, presiding.

COMMITTEE MEMBERS:

JOY REMPE, Subcommittee Chairwoman

RONALD G. BALLINGER, Member

SANJOY BANERJEE, Member

MICHAEL L. CORRADINI, Member*

STEPHEN P. SCHULTZ, Member

GORDON R. SKILLMAN, Member

ACRS CONSULTANT:

KORD SMITH

DESIGNATED FEDERAL OFFICIAL:

WEIDONG WANG

ALSO PRESENT:

GREGORY BROADBENT, Entergy Operations, Inc.

THOMAS COUTU, Entergy Operations, Inc.

BRIAN GREEN, NRR

ASHLEY GUZZETTA, NRR

JAMES HARRISON, GEH*

CHARLIE HECK, GEH*

CHRISTOPHER JACKSON, NRR

LARRY KING, GEH

MARVIN LEWIS*

JOSE MARCH-LEUBA, ORNL

JAMES NADEAU, Entergy Operations, Inc.

RICHARD SCARBROUGH, Entergy Operations, Inc.

AHSAN SALLMAN, NRR

KARL STURZEBECHER, NRR

JUSWALD VEDOVI, GEH

ALAN WANG, NRR

FRANK WEAVER, Entergy Operations, Inc.

GEORGE WILSON, NRR

PETER YARSKY, RES

*Present via telephone

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

2 (10:05 a.m.)

3 CHAIR REMPE: This meeting will now come to
4 order. This is a meeting of the Power Uprates
5 Subcommittee, a standing subcommittee of the Advisory
6 Committee on Reactor Safeguards, and I'm Joy Rempe, the
7 Chairman of this Subcommittee.

8 ACRS members in attendance are Gordon
9 Skillman, Stephen Schultz, Ron Ballinger, and Sanjoy
10 Banerjee will be arriving a bit later today.

11 We have Professor Mike Corradini on the
12 phone and we have our ACRS Consultant, Professor Kord
13 Smith also present. Weidong Wang of the ACRS Staff is
14 the designated federal official for this meeting.

15 In this meeting the Subcommittee will
16 review the Grand Gulf Nuclear Station Unit 1 Operating
17 License Amendment Request to allow plant operation in
18 the expanded maximum extended load line limit analysis
19 plus domain, or MELLLA+ domain, with the presentations
20 from the NRC Staff and representatives from the
21 licensee, Entergy Operations, Inc.

22 We did not receive written comments and
23 requests for time to make oral statements for members
24 of the public regarding today's meeting.

25 Part of the presentations by the licensee

1 and the NRC Staff will be closed in order to discuss
2 information that is proprietary to the licensee and its
3 contractors pursuant to 5 USC, 552(b)(c)(4).
4 Attendance at these portions of the meeting
5 that deals with such information will be limited to the
6 NRC Staff and its consultants, Entergy Operations,
7 Inc., and those individuals and organizations who have
8 entered into appropriate confidentiality agreements
9 with them.
10 Consequently, we need to reconfirm that we
11 have only eligible observers and participants in the
12 room for closed portions of the meeting.
13 The Subcommittee will gather information,
14 analyze relevant issues and facts and formulate
15 proposed positions and actions as appropriate for
16 deliberations by the Full Committee.
17 The rules for participation in today's
18 meeting have been announced as part of the notice of this
19 meeting previously published in the Federal Register.
20 A transcript of the meeting is being kept
21 and will be made available as stated in the Federal
22 Register notice. Therefore, we request that
23 participants in this meeting use the microphones
24 located throughout the meeting room when addressing the
25 Subcommittee.

1 The participants should first identify
2 themselves and speak with sufficient clarity and volume
3 so that they may be readily heard.
4 Now we'll proceed with the meeting, and I'd
5 like to start by calling upon George Wilson of the NRR
6 Staff to begin.
7 MR. WILSON: Good morning. I'm George
8 Wilson, Deputy Director in the Division of Operator
9 Reactor Licensing.
10 I wanted to thank you for this opportunity
11 and the time to brief you on Entergy's Grand Gulf Nuclear
12 Station license amendment request to allow the plant to
13 operate in the MELLLA+ domain under the previously
14 approved extended power uprate conditions of 4408
15 megawatts thermal rated core power.
16 When operating in the MELLLA+ the operating
17 powers maintain constant with the recirculation core
18 flow. It's to operate within a wider window than under
19 the MELLLA conditions.
20 For Grand Gulf this MELLLA+ flow window is
21 between 80 percent and 105 percent flow. This
22 operating flexibility reduces the need for frequent
23 control rod motion.
24 I'd like to note at this time the NRC
25 Staff's second review of a request for the

1 implementation of the MELLLA+ domain, Monticello with
2 being the first, and we have two more coming in, that
3 being Nine Mile and Peach Bottom that you guys will also
4 be having.
5 I'd like to note that in both cases the
6 licensee used the GEH approved MELLLA+ licensing
7 topical report, NEDC-3306, Revision 3, General Electric
8 Boiling Water Reactor Maximum Extended Load Line Limit
9 Analysis for its submittal.
10 The NRC Staff has determined that operation
11 in the MELLLA+ domain at the Grand Gulf Nuclear Station
12 provides additional operation flexibility while not
13 compromising plant safety.
14 A significant portion of the NRC's
15 technical staff's presentation today will include a
16 comparison of the significant differences between
17 Monticello and the Grand Gulf MELLLA+ license amendment
18 reviews.
19 At this point I'd like to turn the meeting
20 over to Alan Wang, the Project Manager for Grand Gulf,
21 who will provide some background on the MELLLA+ license
22 amendment application for Grand Gulf.
23 MR. ALAN WANG: Thank you, George. My
24 name is Alan Wong. I am the Project Manager for Grand
25 Gulf. I just wanted to provide some background

information on the submittal.

They submitted the application on September 25, 2013. The Staff's initial review did not accept it. We sent a request for supplemental information, which they responded, and we accepted the application on January 23rd.

Beyond the normal request for additional information for the amendment the Staff wanted two audits, one at GEH on April 23rd through 25th, and then the second was an audit at the Grand Gulf site at the simulator where we observed their training and it demonstrated some of the critical operator reactions for us.

CHAIR REMPE: Before you leave -- Oh, go ahead.

MR. ALAN WANG: No, sure.

CHAIR REMPE: Okay. No, on the next slide is the better place to ask the question, go ahead.

MR. ALAN WANG: Okay. All right, so the licensee proposed two license conditions in support of the amendment.

The one was to prohibit operations in the feedwater heater out-of-service when in the MELLLA+ domain, and the second condition was the result of the audit on critical operator reactions.

1 They have five crews that need to be trained
2 to demonstrate that they meet the critical operator
3 reactions and they made a license condition to
4 demonstrate that, and that is required prior to the
5 approval of the amendment, that they demonstrate that.
6 MEMBER SCHULTZ: Alan?
7 MR. ALAN WANG: Yes?
8 MEMBER SCHULTZ: Is that license, it
9 sounds as it's worded that that license condition will
10 be in place only to prepare for MELLLA+ and then --
11 MR. ALAN WANG: It actually has two parts
12 to it. The part of it is to prepare, to demonstrate the
13 five crews are trained, and then there's a part of it
14 for continuing compliance that the future crews or
15 operators will be trained and have that.
16 MEMBER SCHULTZ: And so it will be a
17 license condition that stays with the facility because
18 of the requirement for continued training?
19 MR. ALAN WANG: Yes.
20 CHAIR REMPE: And does that include
21 simulator testing and training or is that just a
22 classroom test? Because when I was reading some of the
23 material I got confused.
24 MR. ALAN WANG: I would have to ask the
25 licensee. I'm pretty sure it is.

1 MR. WEAVER: The simulator.
2 MR. ALAN WANG: Yes.
3 CHAIR REMPE: And there will be testing
4 results coming in to NRC?
5 MR. WEIDONG WANG: Can you come over?
6 CHAIR REMPE: You have to go to the mike,
7 say your name, and -- Didn't you listen to my --
8 MR. WEAVER: My name is Frank Weaver,
9 Operations Shift Manager at Grand Gulf. The crews will
10 be evaluated in simulator training.
11 CHAIR REMPE: Okay.
12 MR. WEAVER: And as my presentation will
13 also show that if they do not meet those critical tasks,
14 as Alan was talking about, that they will be removed from
15 the license.
16 CHAIR REMPE: Great. Thank you for
17 clarifying that for me.
18 MR. WEAVER: Does that answer your
19 question?
20 CHAIR REMPE: Yes, sir.
21 MR. ALAN WANG: One thing I didn't mention,
22 as part of the amendment there are several tech spec
23 changes for the implementation of DSS-CD.
24 Those were per the DSS-CD topical report. The
25 Staff has reviewed those and we will, we're not going

1 to approve those.

2 Right now we have three amendments tied to

3 this amendment. The first amendment is they are,

4 Entergy is adopting a single fluence methodology for

5 Grand Gulf. Right now they have two.

6 When they went to EPU they were using one

7 methodology and after EPU they selected a different

8 methodology. The Staff=s had several discussions with

9 them as a result. They submitted an amendment to do one

10 methodology for the entire life of the plant.

11 CHAIR REMPE: And when will all of these

12 amendments be completed? Will they all be done by the

13 time we have our May Full Committee meeting, or what's

14 the status?

15 MR. ALAN WANG: Okay, I'm pretty -- What

16 Chris has told me is that's our goal, is to have them

17 all done for the Full, except -- Okay, and one

18 clarification on the addition of the reference.

19 They're adding the DSS-CD reference to the

20 cooler in the tech specs, the last one. All right, so

21 they submit that as an admin change because they said

22 we've approved the DSS-CD as part of the MELLLA+

23 application.

24 So we'll issue those simultaneously

25 because that won't be true until the MELLLA+ is done.

1 CHAIR REMPE: Okay.

2 MR. JACKSON: Okay, this is Chris Jackson,
3 Chief of the Reactor Systems Branch. Two of the three
4 amendments we're on the track without question to
5 complete.

6 The third amendment I fully expect to
7 complete before the Full Committee. So the one on
8 fluence, we're still working on, you know, MELLLA+ has
9 a very, very small effect on fluence.

10 However, there's a disposition that we ran
11 into problems with the Grand Gulf fluence methodology
12 and as a corrective action they committed to submit a
13 new compliant Reg Guide 1.190 compliant methodology.

14 That's been submitted and we chose to focus
15 on that rather than the kind of amalgam that was used
16 to support MELLLA+.

17 So our intention is to have all three of
18 those approved, two of the three I'm virtually certain
19 we're well on our way to completing those and one of them
20 we're already drafting, the safety evaluation for
21 internal review.

22 We're still working on fluence, but I fully
23 expect to have that one done as well by Full Committee.

24 CHAIR REMPE: There is a difference with
25 the fuel, the GNF2 fuel with the fluence effects, right?

1 MR. JACKSON: Oh, yes, a whole of lot
2 factors impact the fluence.
3 CHAIR REMPE: Right.
4 MR. JACKSON: I mean the fluence
5 methodology covers all of those features. So, you
6 know, there's an NRC approved GE methodology, there's
7 an NRC approved Manahan methodology.
8 When you start mixing and matching that's
9 when we get concerned.
10 CHAIR REMPE: Right.
11 MR. JACKSON: If you have a full 100
12 percent Manahan methodology, we reported before, it's
13 a good methodology, we just have to go through the
14 process in verifying it.
15 You know, we issued a request to do some
16 validation on a 3-D version of it. They've provided
17 that information, we just need to evaluate it at this
18 point. It's been approved before so I have high
19 confidence it will get approved and I think we'll have
20 that done by Full Committee, but we do have to go through
21 that effort.
22 CHAIR REMPE: Okay, thanks.
23 MEMBER SKILLMAN: Let me build on Dr.
24 Rempe's question, please.
25 MR. JACKSON: Sure.

1 MEMBER SKILLMAN: To what extent is the
2 approval dependent upon a single fuel type?
3 MR. JACKSON: Well we'll get into that.
4 The approval of this is based solely on the use of the
5 fuel type they have.
6 You know, this is one of the differences
7 between Monticello and Grand Gulf, so it is dependent
8 on the fuel they have. I mean, but that is the fuel they
9 have.
10 If they want to change fuel they would have
11 to go through its own approval process either using the
12 GE process which would require NRC approval, but that
13 will be addressed elsewhere.
14 We're only evaluating this for the fuel
15 that they have or that they're planning, that they have
16 approval to use now.
17 MEMBER SKILLMAN: Thank you. That was the
18 direction of my question, for reloads and for mixed
19 cores, so we can talk about that a little bit later.
20 MR. JACKSON: Okay.
21 MEMBER SKILLMAN: Thank you.
22 MR. JACKSON: Yes.
23 MR. WEIDONG WANG: Excuse me, I think for
24 those on the bridge line can you please put on mute if
25 you don't talk because we can hear some background

1 noise.

2 CHAIR REMPE: Go ahead.

3 MR. ALAN WANG: Well if there's no other

4 questions so I'd like to introduce Mr. Coutu from

5 Entergy.

6 MR. COUTU: Good morning. Thank you for

7 the opportunity to be here this morning. I will try not

8 to repeat too much of what you've already heard, but we

9 have assembled a team and come here today to present our

10 request to operate in the MELLLA+ domain.

11 We have a number of folks here as

12 presenters, I'll go over that in just in a second, and

13 we also have a support team in case there are technical

14 questions beyond the ability of the presenters to

15 answer.

16 MEMBER SKILLMAN: Thomas, before you go

17 forward may I ask you to back up one slide, please?

18 MR. COUTU: Sure. Oops, sorry.

19 MEMBER SKILLMAN: No. Go back to the --

20 CHAIR REMPE: The picture.

21 MEMBER SKILLMAN: Your picture.

22 MR. COUTU: Okay.

23 MEMBER SKILLMAN: If I'm a good navigator

24 I'm on the East bank and I'm looking North, but my real

25 question is was this intended to be a 2-unit plant and

one is partially completed?

MR. COUTU: Yes, that's correct.

MEMBER SKILLMAN: Yes, sir. Now I understand it gets the oppression Dr. Rempe had a little while ago, and I'll speak with her offline. Thank you.

MR. COUTU: Okay, very well. So today Mr. Greg Broadbent, who is on my far left, will cover the analysis portion of our presentation.

Mr. Frank Weaver, in the brown jacket, will cover the operations portions, operations and operations training portion of our presentation.

James Nadeau will present our regulatory portion, and hopefully that will cover the issues or any questions or information that you may need regarding this presentation.

We also have a number of folks in the audience, Bryan Ford, Guy Davant, Thomas Thornton, Richard Scarbrough, Ricky, well Ricky's not here, Michael Cook, Larry King, and Juswald Vedovi, to provide technical support if needed.

The agenda, we intend to provide an overview of the plant and the, basically an overview of the plant and the LAR request.

Benefits, which include operational benefits as you've heard, and we'll go into those in

1 detail, but suffice it to say that operation of the
2 MELLLA+ region will reduce the number of downpowers that
3 we have to do each cycle to adjust control rod patterns.
4 That, in turn, will reduce the number of
5 challenges to the operators by virtue of the fact that
6 they won't be having to operate the plant in transient
7 conditions as much, so we'll cover that.
8 We'll cover the analysis portion, the
9 operator training portion, and the operating license
10 changes.
11 And with that I would like to turn it over
12 to Mr. Greg Broadbent to cover the overview on the
13 analysis section.
14 MR. BROADBENT: Thanks. Just a little bit
15 of history, Grand Gulf is a BWR 6-Mark III Containment.
16 We got our operating license back in '84, went
17 commercial in '85. The original license thermal power
18 limit was 3833.
19 We did have an Appendix K uprate that
20 increased that by 1.7 percent, and recently had an EPU
21 to our current license thermal power of 4408.
22 CHAIR REMPE: Greg, just because I have to
23 write a letter, or draft a letter for the Full Committee
24 meeting, the power density of the plant I think I dug
25 out at one place in some of the information we saw, the

1 62.3 kilowatts per liter, is that true?
2 MR. BROADBENT: I don't know that number
3 offhand.
4 CHAIR REMPE: I'd ask you to get it to me
5 later.
6 MR. BROADBENT: Okay.
7 CHAIR REMPE: And then is this the highest
8 powered reactor in the U.S. right now, it rated at the
9 highest level?
10 MR. BROADBENT: Yes.
11 CHAIR REMPE: And is it the highest with
12 the power density in the U.S.?
13 MR. BROADBENT: I don't know about power
14 density. GE is indicating no, that's not the case, that
15 there may be others.
16 CHAIR REMPE: Okay. Maybe if you could
17 say well it's in the top third or tenth it would help
18 me to --
19 MR. BROADBENT: I'm sure we're in the top
20 third.
21 CHAIR REMPE: Okay.
22 MR. BROADBENT: Or probably top 10 percent
23 I'm sure.
24 CHAIR REMPE: Okay. That would be good to
25 just recognize at some point.

1 MR. BROADBENT: You know, recognize our
2 power is higher but we have more fuel bundles as well.
3 We have 800 fuel bundles compared to, you know, less than
4 that for other plants.
5 CHAIR REMPE: Okay, thank you.
6 MR. BROADBENT: And the reason why we're
7 asking for this is that we'd like to increase our flow
8 window in order to be able to compensate as our core
9 reactivity is reduced due to fuel depletion and we can
10 have a wider core flow window, be able to stay at rated
11 conditions for longer.
12 That would require then that, or allow us
13 to not make as many rod pattern changes every cycle.
14 Every rod pattern exchange is a reduction in core power,
15 some reactivity manipulations, operator challenges to
16 go down, operate the plant at off-rated power while
17 we're moving rods and all that, and we'd like to be able
18 to not do that as often as we need to now.
19 The fuel efficiency is also improved a
20 little bit with the lower flow capability.
21 MEMBER BALLINGER: Can you --
22 MEMBER SKILLMAN: Greg, can --
23 MEMBER BALLINGER: Go ahead.
24 MEMBER SKILLMAN: Go ahead, Ron.
25 MEMBER BALLINGER: No, go ahead.

1 MEMBER SKILLMAN: May I ask you please to
2 give us an idea of approximately the percentage
3 reduction in a number of rod moves that you're going to
4 make with the MELLLA+ domain versus MELLLA, please.
5 MR. BROADBENT: I have a backup slide I can
6 show you, I guess we can go to the end of this, with some
7 actual data -- Okay, the extra slides aren't on here.
8 MALE PARTICIPANT: Yes, they are.
9 They're hidden.
10 MR. BROADBENT: Oh, okay. Here we go.
11 This is a rod pattern exchange we did back in December
12 and if you look at, we go down to less than 50 percent
13 in core power is the primary power reduction.
14 We do some rod manipulations in this area
15 and then we come back up and it's, the date apparently
16 got cut off on the slide, but this is a, each one of these
17 is a different day.
18 MALE PARTICIPANT: It's in December.
19 MR. BROADBENT: Yes, back in December.
20 And there are a number of different ramps that we have
21 to do right now in order to get back up to full power.
22 MEMBER CORRADINI: May I ask a question?
23 What slide are you on that you're showing these power
24 ups and downs.
25 MR. BROADBENT: It's 35.

1 CHAIR REMPE: It's from the ones that were
2 sent to us yesterday, Mike.
3 MEMBER CORRADINI: Oh.
4 CHAIR REMPE: Open session.
5 MEMBER CORRADINI: All right, so I don't
6 have those. I have the ones sent to me over the weekend.
7 Okay.
8 So may I ask a question about the power
9 swing, the time for the power changes, what is the time
10 to go from a power change as you are describing?
11 MR. BROADBENT: I mean it's four to five
12 days total. We can do the bulk of the work within the
13 first three days or so.
14 MEMBER CORRADINI: So the allowable change
15 in power per minute is what?
16 MR. BROADBENT: Well on the power
17 reduction side it's, you know, pretty high. We can
18 bring power down as quickly as we need to, we do that
19 with core flow, and then there are PCI-related ramp
20 requirements as we go up in power.
21 MEMBER CORRADINI: So I guess what I am
22 driving at is, so it's the PCI limit, that you're limited
23 essentially by PCI power up or down, is that correct?
24 MR. BROADBENT: Well PCI certainly going
25 up.

1 MEMBER CORRADINI: Okay, all right.
2 MR. WEAVER: And if I may, the additional
3 time when we hit the flow ramp, if you will, is between
4 about one-half a percent to 1 percent an hour, if that
5 helps you.
6 MEMBER CORRADINI: Yes, it does. And then
7 the other thing, since we kind of took you this way
8 because of advantages, so the advantages are less
9 operator reaction during a rod movement, but to get back
10 to Mr. Skillman's question, if I think about operating
11 the MELLLA+ regime does that increase the amount of
12 operator reactions when I have a higher-powered flow
13 ratio?
14 MR. BROADBENT: I'm sorry, you --
15 CHAIR REMPE: It's someone calling in and
16 I don't know how to stop that.
17 MR. BROADBENT: You cut off there at the
18 very end.
19 MEMBER CORRADINI: So my question again
20 is, so you made the point that the advantages of the
21 MELLLA+ operational window is to essentially have less
22 rod movements and replace that by core flow movements
23 at higher powers and high flows.
24 MR. BROADBENT: Right.
25 MEMBER CORRADINI: My question is you're

1 now essentially swapping rod movements for flow
2 changes, does that require any operator reactions or a
3 substantially more operator reaction at higher powered
4 of flow ratios when you're down at around 80 percent flow
5 and at near 100 percent power?
6 You must be trading operator reactions or
7 is there really a substantial reduction in operator
8 reactions total?
9 MR. BROADBENT: No, it's a substantial
10 reduction in operator reactions to be able to go down
11 and, you know, to do a pattern exchange is a substantial
12 number of operator reactions.
13 Whereas if you're at 100 percent power and
14 your power is falling due to fuel depletion all they do
15 is just bump up core flow to stay at 100 percent power.
16 It's just a simple, you know, push a button
17 type thing.
18 MEMBER CORRADINI: Just one last thing
19 because I figured that was the answer. Are you relying
20 on any more of the advanced ability and detectant
21 suppress mechanisms just in case you get into a regime
22 where you might have to trip? I would assume so.
23 MR. BROADBENT: Yes, we are relying on
24 confirmation density, which is part of the application
25 that we've submitted supporting MELLLA+.

1 MEMBER CORRADINI: Okay, thank you.

2 MR. COUTU: So, Greg, I want to be sure that

3 we go through the rest of this portion. This is one rod

4 pattern adjustment, see.

5 We do many of these currently, but we're a

6 cycle, and if you'll show the remaining slides to kind

7 of give you an idea of the reduction in the numbers.

8 That's where the real value comes in here.

9 MR. BROADBENT: Right.

10 MEMBER SKILLMAN: Well let me ask one more

11 question then, and that's the last bullet, that is

12 improved fuel efficiency for doing all of those

13 maneuvers. You are consuming radioactivity through

14 xenon every time you do that.

15 MR. COUTU: That's correct.

16 MR. BROADBENT: Yes.

17 MEMBER SKILLMAN: So you are really,

18 wasting isn't the word, but you are expending reactivity

19 to overcome the xenon for those steps.

20 Is that what's really hiding in fuel

21 efficiency in addition to the spectral shift?

22 MR. BROADBENT: Well it's mainly spectral

23 shift. I mean xenon burns off eventually, but --

24 MEMBER SKILLMAN: But you got to overcome

25 it if you want to stay at power.

1 MR. BROADBENT: That's right.

2 MR. COUTU: Greg, are you going to show the

3 remaining two slides that we've got?

4 MR. BROADBENT: Yes.

5 MEMBER SCHULTZ: I think you answered Dr.

6 Corradini and you answered me, thank you.

7 MR. BROADBENT: Okay, thank you.

8 MEMBER BALLINGER: Back to expand on what

9 Dick was saying, you haven't given us a number. How

10 many of these power shifts per year under normal

11 conditions that --

12 MR. COUTU: I think he's going to show us.

13 MR. BROADBENT: Yes, let me go into the, I

14 think it's two slides. So in terms on the impacts there

15 is no change to the maximum license power level, the

16 maximum license core flow, the dome pressure, or any BOP

17 equipment.

18 There are some changes to some NSSS

19 equipment, some, as we mentioned the stability

20 solution, and there are some setpoint changes on the

21 NSSS side.

22 This is the historical power flow map. The

23 gray is the original Grand Gulf license back in '85 power

24 flow map. If you notice that our flow window even then

25 was relatively small.

1 Back in '86 we licensed what was called a
2 MEOD, or a maximum extended operating domain, which
3 included the yellow versions, which was MELLLA on this
4 side, and increased core flow on the high core flow side.
5 That expanded our window down to 75 percent
6 core flow to 105 percent. So that increased our window,
7 then with the Appendix K uprate it shrunk a little bit
8 on the low side and with EPU it shrunk a little bit on
9 the low side.
10 And what we're asking here is to go back to
11 80 percent with MELLLA+ and give us approximately the
12 same flow window that we had with MEOD.
13 Now this is the Cycle 21 fuel design with
14 the core flow manipulations and what I want to show is
15 this is just MELLLA without MELLLA+ and if you notice
16 toward the end of cycle here is where the effect is
17 really significant.
18 There are a number of reductions in core
19 flow. Each one of these is a pattern adjustment.
20 That's when we have to downpower to address the flow
21 window that we have.
22 Now the next slide is MELLLA+ and you'll see
23 --
24 MEMBER SCHULTZ: Excuse me, those are
25 power reductions that you're showing?

1 MR. BROADBENT: Yes, power reductions.
2 MEMBER SCHULTZ: Thank you.
3 MR. BROADBENT: The next slide is MELLLA+
4 and you'll see that there are a lot fewer of them.
5 MEMBER BALLINGER: It looks to me like
6 maybe 40 percent?
7 MR. BROADBENT: Something like that, yes.
8 MEMBER BALLINGER: Okay. I guess the
9 question I have is reduced number of operator actions
10 is equivalent to reduced operator training?
11 MR. BROADBENT: Well they still need to be
12 able to do it.
13 MEMBER BALLINGER: They have do these
14 things and so they get experience at doing them.
15 MR. BROADBENT: Right.
16 MEMBER BALLINGER: I presume that, you
17 know, you do these on a simulator all the time, but
18 there's no substitute for actually doing it.
19 MR. BROADBENT: And they do them
20 throughout the cycle, too, as well, so they're still
21 doing them.
22 MEMBER BALLINGER: So you don't think that
23 there's going to be a net, somehow a net reduction in
24 awareness, if you will, of the operators in the sense
25 that there's less that they have to do so it's sort of

1 like flying an airplane on autopilot all the time, you'd
2 sort of forget how to land, right?
3 MR. WEAVER: Operators are trained who are
4 --
5 MEMBER BALLINGER: I understand that part,
6 okay, but there's no complacency that might sort of
7 creep in there, okay.
8 MEMBER SCHULTZ: But if you compare the two
9 slides there's plenty of opportunity for operator
10 control of the facility, or the reactor itself.
11 MEMBER BALLINGER: That's what I was
12 trying to do, yes.
13 MEMBER SCHULTZ: If you can flip back to
14 the previous slide --
15 MR. BROADBENT: Okay.
16 MEMBER SCHULTZ: There's a gain that's
17 being developed here, but it doesn't eliminate operator
18 reaction during the cycle.
19 MEMBER BALLINGER: I come from the Navy
20 side so when we operate we operate.
21 MEMBER SCHULTZ: Understood. I
22 understand.
23 MEMBER SKILLMAN: Is there any experience
24 in the Boiling Water Reactor's Owner's Group that
25 frequent rod manipulations leads to control rod drive

1 mechanism failures or seal failures or other similar
2 issues to where this reduction in exercise is really an
3 equipment reliability benefit?
4 MR. BROADBENT: Not that we're aware of,
5 no.
6 MEMBER SKILLMAN: I'm not either, but I'm
7 just curious because, you know, one side of this is like
8 Ron says, gee whiz, if you don't rehearse all the time
9 and exercise all the time you're getting rusty.
10 It appears as though you are going to
11 continue to exercise just at a different frequency.
12 MR. BROADBENT: Right.
13 MR. WEAVER: I think we have the technical
14 specifications, surveillance requirement, that we have
15 to exercise every control rod once a month, and that's
16 not changed.
17 MEMBER SKILLMAN: Okay. If there were
18 data that showed that more frequent exercising led to
19 some reliability issues that would be a very significant
20 benefit for MELLLA+, and you're saying right now the
21 data doesn't show that.
22 MR. COUTU: I don't know that there's hard
23 data to do it, but intuitively any transient on the
24 plant, any power maneuver on the plant presents the
25 challenge for, well there's the human reliability

1 issues --

2 (Simultaneous speaking)

3 MR. COUTU: That's correct.

4 MEMBER SKILLMAN: Not necessarily the

5 equipment reliability side.

6 MR. COUTU: So, again --

7 MEMBER SKILLMAN: Not necessarily the

8 equipment reliability side of it.

9 MR. COUTU: I mean potentially it could,

10 but I don't think we have hard data to say yay or nay.

11 MR. BROADBENT: That's right.

12 MR. COUTU: On balance of plant-type

13 equipment that's changing.

14 MEMBER SKILLMAN: Fair enough. Thank

15 you.

16 MR. BROADBENT: Now we'll talk about the

17 methods we used and some of the results, moisture

18 carryover, and the MCPR safety limit.

19 Well the analysis methods are, well we've

20 implemented the latest license topical report revisions

21 for the four methods that are here, the MELLLA+ LTR, the

22 methods LTR, DSS confirmation density LTR, and the TRACG

23 LTR for the stability analysis. We met all the

24 limitations and conditions that are required in those

25 LTR conditions.

1 So and the analysis results, first of all
2 I divided this into small, medium, and large, the
3 negligible impacts are there's no real negligible
4 impact on operating dome pressure, steam and feedwater
5 flow are unchanged, core power is unchanged, so that
6 gets into decay heat and source terms and all the things
7 that arise from that are not impacted by MELLLA+.
8 So that gets us out of doing the dose
9 analysis and addressing decay heat issues and stuff like
10 that. There are some small changes to core performance
11 and some differences in the delta CPRs and we do capture
12 that in our core operating limits report.
13 The biggest changes that we saw with
14 MELLLA+ are associated with the post-ATWS power level
15 and moisture carryover, and we'll talk about each one
16 of those.
17 This is our power flow map again and as you
18 can see what happens in an ATWS is if you're at 100
19 percent power when the, the recirc pumps trip
20 automatically in an ATWS, you run down the rod line and
21 you end up at the natural circulation point.
22 And in MELLLA+, since it has a higher rod
23 line, the natural circulation point is a little bit
24 higher. So that's important because it has effects on
25 operator reaction time and it also has an effect on dome

1 pressure and we have a tech spec change that's
2 associated with our slick system that increases the
3 pressure by about 30 pounds.
4 MEMBER CORRADINI: So can I ask you a
5 question at this point?
6 MR. BROADBENT: Sure.
7 MEMBER CORRADINI: So I think you're on
8 slide, well hang on a second. The slide numbers are
9 changed with your new one. I think you're on Slide 16,
10 is that correct?
11 MR. BROADBENT: Yes, that's correct.
12 MEMBER CORRADINI: Okay. So in actuality
13 the natural in your routine is is you don't actually go
14 down the dotted line, you actually slide down a little
15 bit lower in power and then bounce back up to your red
16 dot, is that not correct?
17 MR. BROADBENT: I'm not sure what you mean.
18 When the recirc pumps trip we go down the rod line.
19 MEMBER CORRADINI: So exactly down the rod
20 line? Because in some of the analysis that I looked at
21 I think the SER, I can find you a page, my impression
22 is that you actually don't go exactly down the rod line
23 you actually go lower in power and then you come back
24 up to the red point?
25 MR. BROADBENT: Well there may be some

1 transient effects in play, but, yes, this is a
2 simplified drawing, but, yes, the exact hydraulic model
3 that GE uses for TRACG probably simulates it better.
4 MEMBER CORRADINI: Okay. Well the reason
5 I'm asking the question is there's a lot of discussion
6 on the corner, which I think is labeled Point C later
7 on, and my question is do you ever realistically go
8 through Point C?
9 MR. BROADBENT: I'm not sure which --
10 MR. COUTU: Slide 21.
11 MR. BROADBENT: Yes.
12 MEMBER CORRADINI: Well I can --
13 MR. BROADBENT: So Point C is the 80
14 percent power, 55 percent core flow state point?
15 MEMBER CORRADINI: Yes, sir.
16 MR. BROADBENT: Okay. Well I mean that
17 would be a potential initial condition that we could be
18 operating at since it's in the --
19 MEMBER CORRADINI: So that's I guess -- So
20 now we're getting back to operator, because in all the,
21 unless I misunderstood the previous rod movement or
22 operator -- I'm getting a bunch of crackle.
23 MR. BROADBENT: We can hear you.
24 MEMBER CORRADINI: Okay. I can't hear you
25 though. It sounds like rustling of papers. So my

1 question, is that a realistic point where you would
2 actually do core flow changes and power changes if you'd
3 start off somewhere around Point C or is that just a
4 hypothetical point in terms of where you actually have
5 operating conditions?
6 MR. BROADBENT: Well recognize that Point
7 C, Point C is the 80 percent power, 55 percent core flow
8 state point. First of all, you know, we're not licensed
9 to MELLLA+ so we can't get there right now, but we
10 wouldn't, you know, we wouldn't intend to operate there
11 on a normal basis.
12 If we were to need to get to Point Delta,
13 Point D, we would need to go close to Point C and then
14 run up the rod line with core flow to get to Point Delta,
15 so --
16 MEMBER CORRADINI: Oh, I see. So your
17 point is, let me just restate it so I make sure I
18 understand. You're saying that if you needed to get up
19 to something which is around 115 percent power and 80
20 percent flow you'd have to go, which is Point D, you'd
21 have to go through C to get there?
22 MR. BROADBENT: Yes. We don't pull rods
23 at 100 percent power, we go up in core flow. So we would
24 go to Point C or somewhere in the MELLLA+ region at the
25 high rod line in order to be able to get to Point Delta.

1 MEMBER CORRADINI: Okay. So let me, I'll
2 ask my general question and I'll come back to it later,
3 which is I'm trying to understand the loss of
4 flexibility if there was no Point C but there was
5 essentially, just for the sake of just thinking about,
6 a straight line from Point B, which essentially cuts off
7 the corner and how much does that reduce your
8 flexibility?
9 Because eventually we're going to get a
10 point where there's a discussion about your power to
11 flow ratio is above the 50 allowable. I want to
12 understand how much that affects you at terms of
13 operation.
14 MR. BROADBENT: Well it would be difficult
15 to get to Point D because to get to Point D we would need
16 to go, you know, we would need to be on a rod line that
17 would take us through Point D and that rod line goes
18 through Point C.
19 So we would need to be, you know, we would
20 need to be pulling rods at high power in order to get
21 to, you know, the lower end of the flow regime.
22 MEMBER CORRADINI: Okay. All right, I
23 think I understand. I'll come back to it later. I just
24 wanted to make sure I understood the plot that you gave
25 us, the conceptual plot.

1 MR. BROADBENT: Okay.

2 MEMBER CORRADINI: Thank you.

3 MR. BROADBENT: You're welcome. So as I
4 had mentioned here in the power flow map this higher
5 post-RPT power causes us to look at operator actions
6 and, well it's higher, and the MELLLA+ region requires
7 us to look at operator reactions a little closer and it
8 also introduces an increased slick pressure change to
9 our tech specs.

10 Now getting to moisture carryover,
11 moisture carryover does increase with MELLLA+, it's
12 predicted to at least with GE's models. The peak, or
13 at least the predicted peak for EPU is 0.069 percent
14 currently and it's predicted to increase to a peak of
15 0.194 percent with MELLLA+.

16 We've looked at the effect of this on
17 effluent releases, steam line components, our FAC
18 program and all, and we have a limit of 0.33 percent.
19 So we can go up as high as 0.33 percent, we're predicted
20 to be at 0.2 percent.

21 MEMBER CORRADINI: So I have a question
22 here, why is the moisture carryover going up when your
23 core flow is going down?

24 MR. BROADBENT: It gets into the
25 performance of the steam separators. They are designed

1 for a certain void ratio, or at least a range of voids,
2 and if you get too high on the low side or on the high
3 side the, you know, the performance degrades.
4 MEMBER CORRADINI: And so that's a
5 prediction or a measurement from other steam line
6 separators?
7 MR. BROADBENT: I think that's a known
8 effect, so that's a measured effect.
9 MEMBER CORRADINI: Okay. I just didn't
10 understand why.
11 CHAIR REMPE: The 0.33 limit, what is that
12 based on?
13 MR. BROADBENT: It's based on the limiting
14 component in the steam line. We actually did a lot of
15 calculations at 0.35 percent, but then when we looked
16 at the steam line we were limited in the steam line.
17 Some of the components in the steam line,
18 we have the MSIVs and we have some downstream valves
19 called the mainstream shutoff valves which are credited
20 in operating our MSIV leakage control system.
21 They have a limit on their, their design
22 limit for moisture is 0.5 percent. So --
23 MEMBER CORRADINI: And what happens if you
24 go above the limit, what's the degradation in
25 performance?

1 MR. BROADBENT: Well they are designed for
2 0.5 percent, so we don't want to go above 0.5 percent.
3 That's 0.5 percent where they are located in the steam
4 line, that correlates to a limit leaving the vessel,
5 which I'm quoting here, which is 0.33 percent.
6 MEMBER SCHULTZ: Greg, could you describe
7 the relative increase in the effluent releases?
8 MR. BROADBENT: Yes. It was in our
9 license amendment we described that and it was like a
10 10 to 20 percent, something like that. We looked at
11 where we were relative to the effluence and if we were
12 operating at this 0.94 percent for very long where we
13 would be.
14 I don't remember the exact number offhand.
15 We can --
16 MEMBER SCHULTZ: Okay. So you got a -- The
17 next chart, at least in the slides I have, shows the
18 relative moisture carryover over the --
19 MR. BROADBENT: Over the whole cycle,
20 right.
21 MEMBER SCHULTZ: The cycle, and is that
22 what you would be comparing where you are today in terms
23 of performance versus what you have in MELLLA+, or just
24 looking at peak to peak?
25 MR. BROADBENT: We're just looking at peak

1 to peak.

2 MEMBER SCHULTZ: Okay. So you're looking

3 at the effluent releases at the peaks in making that

4 determination?

5 MR. BROADBENT: That's right.

6 MEMBER SCHULTZ: So if you looked at the

7 cycle average you'd probably have an impact that would

8 be less?

9 MR. BROADBENT: It would be a lot less,

10 right.

11 MEMBER SCHULTZ: Okay.

12 MR. BROADBENT: Right. And I think that

13 slide has been moved to a backup slide.

14 MEMBER SCHULTZ: Okay, a backup.

15 MR. BROADBENT: But it was there just to

16 show that -- It's Slide 19. It was there just to show

17 that it's a very small portion of the cycle where we

18 would predict to be at that peak for the rest of the

19 cycle.

20 MEMBER SCHULTZ: Like the one on Slide 36.

21 MR. BROADBENT: For the rest of the cycle

22 it's going to be a lot less.

23 MEMBER SCHULTZ: That's correct, but,

24 however, the whole cycle it looks like is higher than

25 your current peak.

1 MR. BROADBENT: That's right. That's
2 right, it is. It's predicted to be, but I'll point out
3 also, and it's the last bullet on here. Sorry about
4 scrolling through this real quick.
5 MEMBER SCHULTZ: Slide 18.
6 MR. BROADBENT: The current measurement is
7 0.158 percent, 0.0158 percent, so much less than the
8 peak.
9 MEMBER SCHULTZ: When you say effluent
10 releases, so does this moisture carryover does it, how
11 does it impact your releases toward the site limits for
12 effluent release?
13 MR. BROADBENT: I mean it's a liquid
14 release and there's more corrosion products, more
15 iodine that gets carried over in the liquid, and, you
16 know, a fraction of that can be released as part of the
17 plant liquid release.
18 MEMBER SCHULTZ: Okay.
19 MR. BROADBENT: And it's just because the
20 corrosion products likely, you know, prefer the liquid
21 state.
22 CHAIR REMPE: So where it says "steam line
23 components," you're really talking flow-induced
24 vibration?
25 MR. BROADBENT: No. These are the MSIVs,

1 moisture carryover has an effect on the MSIVs and the
2 main steam shutoff valves, which I mentioned. They are
3 designed to 0.5 percent.
4 MEMBER CORRADINI: I think what Joy is
5 asking though is why?
6 MR. BROADBENT: Why?
7 MEMBER CORRADINI: Is it corrosion or
8 erosion of the material at a too high of a water content?
9 MR. BROADBENT: That's my understanding,
10 yes.
11 CHAIR REMPE: I thought in some of the
12 information I read that they basically did say that
13 there was some increase in vibrations from the fact that
14 the water level is lower when you go to MELLLA and that
15 --
16 MR. BROADBENT: That's a steam dryer
17 effect.
18 CHAIR REMPE: Okay.
19 MR. BROADBENT: And they analyze that and,
20 you know, we met the acceptance criteria for the steam
21 dryer.
22 CHAIR REMPE: Okay. So then I'd like to go
23 further with all the measurements you made for the steam
24 dryer when you were going to EPU.
25 MR. BROADBENT: Yes?

1 CHAIR REMPE: How well did your model match
2 the measurements that you made and was there
3 consistency?
4 MR. BROADBENT: I think there was enough
5 consistency, you know, based on what we saw and, you
6 know, we were able to, you know, match, and GE was able
7 to match with their model what we saw in the plant with,
8 you know, I'm sure it wasn't exact, but a reasonable
9 amount of consistency so that, you know, we felt
10 confident in the numbers that we saw for EPU.
11 That instrumentation is no longer
12 installed.
13 CHAIR REMPE: Okay. Of the facts that you
14 listed there which ones do you think, or which one is
15 the most important for the moisture carryover?
16 MR. BROADBENT: Well the one that was
17 driving us was the steam line components. That's what
18 set the limits.
19 CHAIR REMPE: Thank you.
20 MEMBER CORRADINI: If I might just ask,
21 because I don't think this is a worry, but I just want
22 to put it into context, you don't have to go to Slide
23 36 for this. Slide 36 you show, is that a calculation
24 or a measurement from past measurements?
25 MR. BROADBENT: That's a prediction, so

1 that's a calculation.

2 MEMBER CORRADINI: Okay. And then to go

3 back to Slide 18 where you said originally measured MCO

4 is 0.0158 --

5 MR. BROADBENT: That's a measurement.

6 MEMBER CORRADINI: Okay. So that's three

7 significant figures, what's the plus or minus on that

8 measurement?

9 MR. BROADBENT: The uncertainty?

10 MEMBER CORRADINI: I'm trying to

11 understand the uncertainty on that measurement since

12 you quote three significant figures.

13 MR. BROADBENT: I don't know. The reason

14 why we quote three significant figures is probably

15 because of that low, but I don't know offhand the

16 uncertainty. It's a sodium-24 measurement that's

17 performed.

18 MEMBER CORRADINI: So let me ask you in

19 reverse. Is that 0.016 plus or minus the factor or is

20 that 0.016 plus or minus the factor of ten?

21 MALE PARTICIPANT: It can't be ten.

22 MR. BROADBENT: Yes. I'm sure it's in the

23 range of 10 to 20 percent. I mean we can --

24 MR. SCARBROUGH: It's a 10 percent, plus or

25 minus 10 percent.

1 MR. BROADBENT: Okay. Richard
2 Scarbrough, our former chemistry manager is indicating
3 that the uncertainty is plus or minus 10 percent.
4 MEMBER CORRADINI: Okay. All right,
5 thank you.
6 MEMBER BALLINGER: So that change, does it
7 have a significant effect on where the Wilson line is
8 in the low pressure turbine?
9 MR. BROADBENT: The low pressure turbine
10 is, you know, downstream and --
11 MEMBER BALLINGER: Not affected at all?
12 MR. BROADBENT: No.
13 CHAIR REMPE: Okay. But from the
14 calculation that showed that it varied during the cycle,
15 how often are the moisture carryover measurements made?
16 I mean this was one measurement at one time
17 in the cycle. Do you do it daily or weekly or monthly?
18 MR. SCARBROUGH: It's quarterly.
19 MR. BROADBENT: It's quarterly.
20 MR. SCARBROUGH: Sometimes more
21 frequently, but at least quarterly.
22 CHAIR REMPE: Okay.
23 MR. BROADBENT: Yes. Sometimes more
24 frequently, but at least quarterly.
25 CONSULTANT SMITH: Can you show us any

1 comparison of what the predicted is to the points at
2 which you have measurements?
3 MR. BROADBENT: I don't have the -- We only
4 predicted it for MELLLA+ because that's where we thought
5 it was a concern.
6 We list, this 0.069 percent EPU number is
7 an EPU produced number because we needed to look at it
8 for EPU, but we don't have a comparison between the
9 prediction and the measured.
10 But from what we've seen, relative to at
11 least the peak, it's, you know, the measured has been
12 less, so we feel the GE model is conservative but we
13 don't have the data to say that definitively.
14 MEMBER CORRADINI: So not to beat a dead
15 horse, but somewhere you must have done a benchmark.
16 Did GE do a benchmark on another plant?
17 MR. BROADBENT: I'll have to get that
18 information from GE. I'll tell you what, that's
19 something we can cover in the closed session if you'd
20 like.
21 MEMBER CORRADINI: Yes. I guess I'm not
22 concerned about the issue because you are so far away,
23 but on the other hand I think all our questions are
24 basically asking how did they get benchmarks so I can
25 make those calculation?

1 MR. KING: This is Larry King with
2 GE-Hitachi. The data was based on testing done back in
3 the original design of the component, so we've used
4 theme testing data that we did with a dryer and a
5 separator component and we were able to predict, or we
6 are predicting based of off we had for testing.
7 There's an awful lot of factors that go in
8 to finally doing the NCO so that it could be variable
9 over the cycle, but, again, we think we have a
10 conservative analysis.
11 And I think with EPU we had predicted it
12 would be about 0.06, so they have a new dryer and it's
13 based on how they're operating, it's operating more
14 effectively than predicted.
15 CHAIR REMPE: So there was another plant
16 that came in and they just said that there was the
17 potential for it and they just never saw it evident.
18 Has there been any installed dryers that
19 have seen these effects? I mean you said you've done
20 testing on the design, but once it's installed and
21 operated?
22 MR. KING: There have been some plants that
23 I've seen MCO go as high as the 0.1.
24 CHAIR REMPE: Okay.
25 MEMBER BANERJEE: There's only one plant

1 that's gone into the MELLLA+ region. Has it actually
2 done that now, Monticello?
3 MALE PARTICIPANT: Yes.
4 MEMBER BANERJEE: Is it operating in
5 MELLLA+ right now?
6 MEMBER CORRADINI: No. I don't think so,
7 Sanjoy.
8 MEMBER BANERJEE: Okay.
9 MEMBER CORRADINI: They're still working
10 their way up.
11 MEMBER BANERJEE: Okay. I think that's --
12 So we have no plant in that region right now, right?
13 MR. JACKSON: Just to clarify, I don't know
14 the exact answer. So the MELLLA+ region spans quite a
15 bit of flow. I think they've entered the MELLLA+ flow
16 region. I don't think they've gotten full 100 percent
17 --
18 (Simultaneous speaking)
19 MEMBER BANERJEE: They haven't got down to
20 all of it, all right.
21 MR. JACKSON: That's my understanding.
22 MR. ALAN WANG: Yes. And, also, Entergy
23 has two regulatory commitments regarding MCO, but they
24 were dew measurements to ensure themselves that they
25 stayed within the limits.

1 MEMBER BANERJEE: But these limits are
2 measured what, once a quarter? I mean these
3 measurements are made once a quarter? That's what we
4 heard right now.
5 MR. NADEAU: Yes, this is Jim Nadeau,
6 Regulatory Assurance Manager. Once a quarter is our
7 normal surveillance frequency for moisture carryover.
8 In addition to that, as part of going to the
9 MELLLA+ region, once approved, we will do additional
10 moisture carryover testing to confirm that we're within
11 our analysis results.
12 MEMBER BANERJEE: Oh, okay, all right. So
13 you will continue to do the testing during the entering
14 into this region?
15 MR. NADEAU: That's correct.
16 MEMBER BANERJEE: That is fine with me.
17 MEMBER SCHULTZ: Greg, perhaps to close
18 this, with regard to the flow accelerated corrosion
19 program does this mean you're making any changes to that
20 program or you just understand that there may be some
21 impacts that you need to watch for?
22 MR. BROADBENT: We're not making any
23 changes, but we understand that there are some impacts
24 that we need to watch depending on the actual
25 measurements that we get.

1 MEMBER SCHULTZ: Good. Thank you.

2 MR. BROADBENT: All right. Let's talk

3 about the MCPR safety limit. There are several

4 limitations associated with MCPR safety limit

5 calculation. There's a 0.01 adder for operation at

6 less than 42 megawatts per million pounds per hour, it's

7 0.01.

8 0.02, if you're greater than that there is

9 also, if you are in the MELLLA+ region you are required

10 to apply a single loop core flow uncertainties to your

11 MCPR safety limit calculation, which are higher than the

12 two loop core flow uncertainties.

13 And there's also a requirement to perform

14 a power distribution assessment and establish that the

15 neutronic methods actually on nodal power distribution

16 uncertainties have not increased, and we've done that

17 and submitted it to the Staff.

18 MEMBER BANERJEE: Are you going to talk

19 about this in closed session a little bit about the power

20 distributions and things, void fractions?

21 MR. BROADBENT: From the perspective of

22 the critical power correlation. I don't know if you

23 were interested in uncertainties in methods or --

24 MEMBER BANERJEE: Well, yes. You are

25 going to enter into regions of fairly high void

1 fractions, right, and then you reduce the flow?
2 MR. BROADBENT: Right.
3 MEMBER BANERJEE: I mean I don't what is
4 proprietary and what is not yet, so it's up to you. We
5 want to discuss that certainly. I prefer we can do it
6 in closed session.
7 MR. BROADBENT: Let's do it in the closed
8 session because it gets into GE and methodology and --
9 MEMBER BANERJEE: All right, okay.
10 MR. BROADBENT: And, again, this is the
11 power flow map. Points E, F, and G here are parts of
12 our current power flow map. D and E, I'm sorry C and
13 D are points in the MELLLA+ region that for the safety
14 limit are analyzed with the higher core flow single loop
15 uncertainties.
16 And we just have kind of a breakdown of our
17 safety limits. The current safety limit is 1.11 and
18 it's calculated at the points that we're currently
19 allowed to be at, E, F, and G, you know, without MELLLA+,
20 and it's a 1.09 there.
21 There is also a penalty for being greater
22 than 42 megawatts per million pounds per hour power to
23 flow ratio, and that's 0.02. So the final MCPR is 1.11.
24 Now for MELLLA+ when we analyze with the
25 higher single loop core flow uncertainties that adds a

1 0.04 to our MCPR safety limit, so that's across all our
2 MCPR operating limits is a 0.04, that raises it to 1.13.
3 Again, with the outer being greater than 42
4 that increases our MCPR safety limit to 1.15. So we've
5 submitted under a separate license amendment a MCPR
6 safety limit change to 1.15.
7 MEMBER BANERJEE: Is there any effect on
8 the operating limit?
9 MR. BROADBENT: Well, yes, it would be one
10 to one because the delta CPRs are approximately the
11 same. So for every increase from 1.1 to 1.15 there
12 would be a 0.04 increase in the operating limit.
13 MEMBER BANERJEE: And is that limiting the
14 turbine trip or what's the operating limit?
15 MR. BROADBENT: Yes, I think turbine trip
16 --
17 MEMBER BANERJEE: With bypass or without
18 bypass?
19 MR. BROADBENT: No, without bypass.
20 MEMBER BANERJEE: Okay. And it's about
21 the same effect?
22 MR. BROADBENT: When you say "about the
23 same effect," --
24 MEMBER BANERJEE: In the safety limit?
25 MR. BROADBENT: Right. It's a one to one

1 approximately. The delta CPR is approximately the
2 same.
3 MEMBER BANERJEE: Okay.
4 MR. BROADBENT: And this is all picked up
5 in our core operating limits, so we analyze this, you
6 know, the different events explicitly for MELLLA+
7 operation.
8 Are there any more questions on the
9 analysis? We do have some additional discussion in the
10 closed session, but with that I'll turn it over to Frank.
11 MR. WEAVER: Thank you, Greg. Frank
12 Weaver, Operation Shift Manager. I'll be talking about
13 the time critical operator reactions in our simulator
14 audit results.
15 The MELLLA+ operating range expansion does
16 change the dynamics for an ATWS and ATWS instability
17 event. As such, as we've talked about earlier, we're
18 going to have a license condition to commit to mitigate
19 those changes.
20 The first being initiate reactor water
21 level reduction within 90 seconds in an ATWS condition
22 greater than 5 percent power and when the reactor recirc
23 pumps trip off.
24 The second is to initiate standby liquid
25 control systems, sodium pentaborate system, within 300

1 seconds after the initiation of an ATWS event.
2 And the last one is to initiate suppression
3 pool cooling after the initiation of an ATWS event
4 within 660 seconds.
5 MEMBER BANERJEE: So, again, the question
6 that I have, because I don't remember, is how do these
7 numbers compare to Monticello?
8 MR. WEAVER: I don't know what
9 Monticello's numbers are. GE may know that.
10 MEMBER BANERJEE: Okay.
11 MR. WEAVER: But I'm sure they're pretty
12 close.
13 MEMBER BANERJEE: Do you want to talk about
14 it later?
15 MR. JACKSON: I believe the numbers are the
16 same.
17 MEMBER BANERJEE: Are they the same?
18 MR. JACKSON: But we have a pretty good
19 comparison on our slides.
20 MEMBER BANERJEE: Okay.
21 MR. WEAVER: Okay. As Mr. Wong talked
22 about earlier the Staff did come to Grand Gulf in October
23 of 2014 in particular to look to make sure, ensure to
24 themselves, that we could meet the time critical
25 operator reactions.

1 We set up our Grand Gulf simulator with the
2 MELLLA+ operating domain. Initial conditions were 100
3 percent core thermal power, recirculation flow at 80
4 percent, which is the Bravo or the Charlie Point on the
5 power to flow map, which set us up for a load line, or
6 rod line, whichever you like to call it, of 115 percent.
7 MALE PARTICIPANT: Just to be clear that's
8 the Delta point on the map.
9 CHAIR REMPE: Excuse me for a minute.
10 Excuse me for a second. Someone out there on the line,
11 you're making a lot of noise, could I ask you to please
12 put it on mute because we're having trouble listening
13 to the speakers. I apologize, but --
14 MR. WEAVER: That's fine.
15 CHAIR REMPE: Go ahead.
16 MR. WEAVER: And a correction, I'm on the
17 Delta point on the power to flow map, so that's a 115
18 percent rod line and we're at 100 percent power.
19 We initiated the limiting event, which was
20 limited as far as peak center line temperature event,
21 100 percent ATWS and --
22 MEMBER BANERJEE: Is that from Point C or
23 where are you?
24 MALE PARTICIPANT: On Delta.
25 MEMBER BANERJEE: Delta, okay.

1 MR. WEAVER: On Delta.

2 MEMBER BANERJEE: Okay, fine. Yes, all

3 right. Thank you.

4 MR. WEAVER: Which is a worst case.

5 MEMBER BANERJEE: Yes.

6 MR. WEAVER: We initiated a main turbine

7 trip with bypass and the operators responded to that by

8 lower initiating the reduction in core flow within the

9 90 seconds and initiated the standby liquid control and

10 initiated suppression pool cooling.

11 To demonstrate this we have a short video

12 I'd like to show you, and before we do that this is the

13 Grand Gulf simulator. Just to show you the positions

14 that we have, we had minimum staff, which is two reactor

15 operators and one senior reactor operator in the

16 simulator.

17 This gentleman here is the operator at the

18 controls. This gentleman here is the control room

19 operator, and behind you, out in the back here, would

20 be the control room supervisor, and you'll see him soon

21 when the event starts.

22 The layout of the control room briefly,

23 here is the feedwater and condensate system for Grand

24 Gulf. Grand Gulf has two variable speed steam driven

25 reactor feed pumps.

1 We have two reactor recirc pumps that are
2 slow speed and high speed with flow controlled by recirc
3 flow control valves.
4 The reactor control bench board is we have
5 193 control rods. These instruments right here are the
6 average power range monitors, we have four channels of
7 those.
8 Here are our main turbine controls, main
9 turbine support and auxiliaries and the reactor water
10 cleanup system. Over here on this panel we have the
11 main steam line isolation valves here and here.
12 The safety relief valves, which Grand Gulf
13 has 20 safety relief valves. From this side on down is
14 the ECCS systems. We have three divisions of ECCS with
15 supporting diesel generators, Division 1, 2, and 3
16 diesel generators.
17 We have a reactor core isolation system, of
18 course, and for Grand Gulf we have a high pressure core
19 spray system, which is a motor driven by, some plants
20 have a steam driven system.
21 This panel right here is just support
22 systems for the ultimate heat sink and other plant
23 support system.
24 MR. NADEAU: Frank, standby liquid
25 controls.

1 MR. WEAVER: I'm sorry, thank you. You
2 also see here and here are the key switches for the
3 initiation of standby liquid control. We do not have
4 an automatic slick system, it's all manual and
5 controlled by emergency procedures.
6 So what I have, when I start the video the
7 crew will be just in normal standby and the event starts
8 approximately five seconds into the, the clock time, if
9 you will, and we can use this as a timer for the actions,
10 and I'll stop periodically to explain what we're seeing.
11 So what we're seeing here, again, is a 100
12 percent initial condition core thermal power, load line
13 of 115 percent, the main turbine will trip, the main
14 turbine bypass valves will open and pass approximately
15 30 percent of the total steam flow from the reactor.
16 Others remaining will go to the SRVs. Okay.
17 MEMBER SCHULTZ: Frank, before you start
18 --
19 MR. WEAVER: Yes, sir?
20 MEMBER SCHULTZ: What's the context of
21 this exercise? Is it a crew that's just in a training
22 mode on the simulator?
23 MR. WEAVER: These are, this gentlemen
24 here is a former SRO who is in training.
25 MEMBER SCHULTZ: All right. Correct, but

I'm just -- In terms of this scenario have they been prompted that this is a scenario that they're going through?

MR. WEAVER: Yes, they know that this is coming, that's correct.

MEMBER SCHULTZ: Okay.

MR. WEAVER: All right.

(Video playing)

MR. WEAVER: Okay, now the operator that operates the controls just announced a 40 percent ATWS. That is because the recirc pumps have already tripped off.

Okay, when the recirc pumps trip off the force flow is removed from the reactor and power immediately goes down, even from the 115 percent rod line.

Now this gentleman right here is going to do a couple of actions to inhibit the ADS system, automatic depressurization system, and he's going to go over here and override our high pressure core spray system because we don't want them to inject on an ATWS and we want to control the operation of SRVs.

The operator at the control will trip one feed pump, because we're less than 50 percent power, which in and of itself starts a reduction in flow, if

1 you will, but we're not crediting that as far as the 90
2 seconds. So we'll continue on here.
3 (Video playing)
4 MR. WEAVER: EP2 Alpha as he just noted is
5 our emergency procedure that deals with the ATWS.
6 (Video playing)
7 MR. WEAVER: All right, at this point the
8 control room operator is getting in his hand what we call
9 our hard card for placing the condensate and feedwater
10 system in single feed pump operation behind what we call
11 a startup level control valve to control reactor power
12 at lower powers.
13 And you'll see him making some
14 manipulations, and I'll give you a prompt when we have
15 stopped the 90 second timer. Currently we're at 50
16 seconds on the clock, but realize we were five seconds
17 before the event actually started.
18 (Video playing)
19 MR. WEAVER: All right, he is just about to
20 place the remaining reactor feed pump in manual mode for
21 the speed controllers and then you will see him move his
22 finger to the right approximately one inch and he'll
23 start lowering the speed output on that one reactor feed
24 pump, which, of course, reduces the flow feeding to the
25 reactor.

1 (Video playing)

2 MR. WEAVER: All right, he's a manual and

3 now he is going to lower --

4 (Video playing)

5 MR. WEAVER: He's actually already done

6 it, he's already lowered the feed pump speed controller,

7 so we'll say that we're at 70 seconds there minus the

8 five seconds, so that's around 65 seconds to meet the

9 90-second from an ATWS greater than 5 percent with the

10 recirc pumps tripped off.

11 And the whole basis for this is to mitigate

12 the instability that is inherent when you trip the

13 recirc pumps off, okay.

14 He's lowering the reactor water level

15 band to minus 70 to minus 130 inches wide range and that

16 is per the analysis to get the feedwater injecting two

17 feet below the water level such that we get preheating

18 of the feedwater to heat the feedwater up.

19 As it enters the core it will also mitigate

20 and lower core thermal power and remove the instability

21 events from the ATWS.

22 MEMBER CORRADINI: So, Frank, may I ask a

23 question?

24 (Video playing)

25 MR. WEAVER: I'm sorry?

1 MEMBER CORRADINI: If you're going to
2 finish, go through the video some more, I had a question
3 when you're done with the video.
4 MR. WEAVER: Actually, we're pretty much
5 done. We can let it go out a little further, but you'll
6 see the initiation of slick at two minutes and 15 seconds
7 and later on we would initiate suppression pool cooling.
8 So that's really all I intended to show you.
9 We showed this to the Staff, well actually we performed
10 this for the Staff in October and met these same times
11 as well. Go ahead with your question.
12 MEMBER SCHULTZ: So I'm sorry, you said --
13 Excuse me, Mike. Slick was initiated two minutes and
14 15 seconds?
15 MR. WEAVER: Yes.
16 MEMBER SCHULTZ: Okay.
17 MEMBER CORRADINI: So I kind of want to
18 follow on Steve's question, which is, if I understood
19 correctly, the operators knew this was coming. In
20 their training sequence when do you do ATWS training
21 where they don't know it's coming and it's essentially
22 an unanticipated event they respond to?
23 MR. WEAVER: Every training cycle, which
24 is five weeks.
25 MEMBER CORRADINI: They may or may not see

1 an ATWS event?

2 MR. WEAVER: Oh, they will see an ATWS

3 event.

4 MEMBER CORRADINI: Okay. And so what I'm

5 trying to get at is the uncertainty in reacting to it,

6 because I can't tell, since I'm not an operator, if 65

7 seconds when you needed 90 seconds is good or bad.

8 And so when you do these unanticipated what

9 is the range from the various crews that you get in terms

10 of their ability to respond as you want them to?

11 MR. WEAVER: I understand your question.

12 We have not given this to the crews yet. This is a

13 training group, if you will. We did not want to give

14 that training to the operators as of yet to confuse them

15 on how they respond currently to an ATWS situation.

16 MEMBER CORRADINI: Okay, but currently you

17 have to train them for ATWS and their required reaction

18 time is 120 seconds, is it not?

19 MR. WEAVER: No. We have no current

20 required action, only through this MELLLA+ application

21 do we have the 90-second time critical action.

22 MEMBER CORRADINI: Oh. Well I was under

23 the impression you had to with an ATWS under current

24 MELLLA conditions had to have a response time less than

25 120 seconds.

1 MR. WEAVER: No. We don't have that as a
2 time critical action currently.
3 MEMBER CORRADINI: I see.
4 CHAIR REMPE: I think Chris has a comment.
5 MR. JACKSON: Well just to provide some
6 context. My name is Chris Jackson. So you do train
7 your operators for ATWS, you do have an ATWS analysis
8 now.
9 MR. WEAVER: Yes.
10 MR. JACKSON: If I understand correctly
11 your ATWS analysis now assumes 120 seconds, but that
12 isn't designated as a, if I understand you correctly,
13 a time critical operation reaction.
14 MR. WEAVER: That's correct.
15 MR. JACKSON: When we're doing MELLLA+ we
16 focus more effort on ATWSI because the consequences can
17 be worse starting from lower flow, so --
18 MEMBER CORRADINI: Oh, yes. Okay, but so
19 let's just follow with this. Do you have crew data with
20 120 seconds, and so it's not required, but it's
21 effected, in terms of the variations of the crew
22 performance relative to the 120 seconds, because if
23 you're training them now you must have data?
24 MR. WEAVER: I don't have that data with
25 me, no.

1 MEMBER CORRADINI: Okay. So I'll ask my
2 question and leave it for later. The essence of my
3 question is what's the variability in crew performance
4 with your current expected performance so that I can get
5 a feeling for what you're doing because you've just
6 reduced the prior time by about 25 percent.
7 CHAIR REMPE: I'd even go a bit further,
8 when this came up before with another plant we brought
9 up the fact that we suggested strongly they use
10 NUREG-1852 to quantify that uncertainty and they
11 actually did come back, we made it a question that we'd
12 like a response to what is the uncertainty in that time.
13 MR. WEAVER: Okay.
14 CHAIR REMPE: And so that would be
15 something that I'd like to see.
16 MEMBER CORRADINI: So I think the reason
17 I'm asking the question is is I have no familiarity as
18 to what the crew, well how they behave now given that
19 they're being trained with an unexpected transient, so
20 at least I get a feeling for what it is compared to what
21 you're requiring of on, or this where it's a required
22 90-second response time.
23 MR. COUTU: So we may not have that data
24 historically, however, remember we have a commitment to
25 train all the crews with a time critical task.

1 They will not be able to operate our reactor
2 if they cannot complete the time critical task within
3 90 seconds.
4 MEMBER CORRADINI: Okay. So then --
5 MR. COUTU: And we will have then that data
6 established when we train the crews prior to
7 implementation.
8 MEMBER CORRADINI: Okay. But then that
9 would lead me to agree with Joy about following up a --
10 Joy knows the NUREG, but essentially an analysis that's
11 consistent with this NUREG that Joy quoted.
12 MEMBER SCHULTZ: I think we're trying to
13 get an understanding or an appreciation for the context
14 here, that is what is the change in, is the change an
15 expectation for crew performance remarkable?
16 MR. WEAVER: No, it isn't.
17 MEMBER SCHULTZ: I don't think it is and
18 yet given the statements of well, if the crews can't
19 achieve this they can't operate the facility, and I
20 understand that that's certainly something that needs
21 to be established.
22 But on the other hand, and what Mike was
23 searching for is this is an event that is, as you said,
24 it's frequently examined in simulator space and there
25 must be information as to how these actions are taken

now even though there's no requirement to do it in 90 seconds.

MR. WEAVER: Right.

MEMBER SCHULTZ: And that would give some appreciation for what increase in expectation we're really looking for here.

MR. WEAVER: Yes. Any data I would give you would just be my perspective. It would not be hard data.

MEMBER SCHULTZ: And you may not be able to recover that in a meaningful way is what I'm hearing Tom say.

MR. WEAVER: That's right.

MEMBER SCHULTZ: And it would be better just to presume that the going forward approach is the best thing that we can do.

CHAIR REMPE: But on the other hand I think you can think about some of the uncertainty in that time of a sneeze. Something, I mean to quantify what is an adverse condition.

MEMBER SCHULTZ: Right.

CHAIR REMPE: This simulator, they were expecting it to come in and so I'm not sure that that time is enough to go forward.

MR. WEAVER: But I would also suggest that

in watching the video I think you would agree that it wasn't rushed.

CHAIR REMPE: Right.

MR. WEAVER: The operators were very, you know, they were, they stepped through their actions and to at least hit the 90-second reduction flow requirement.

MEMBER SCHULTZ: The previous applicant wasn't doing exactly what you're doing, but they were able to gather enough information to follow the NUREG and provide a context of the meaning, the uncertainty, you know, the various range in performance.

MR. WEAVER: And part of our --

MEMBER SCHULTZ: To answer my question.

MR. WEAVER: -- information we're going to give to the Commission will be the range of the crews response to these time critical actions. That's part of the information for the licensing issue.

MEMBER SCHULTZ: In addition to setting an expectation which will be you must meet this or you can't operate the facility.

MR. WEAVER: Correct. That's correct.

MEMBER CORRADINI: So if I might ask one additional question. Steve quoted a time, I didn't hear it, but he repeated it, that in your anticipated,

where the crew actually anticipated this is the training sequence they initiated slick at a little over two minutes if I remember correctly?

MR. WEAVER: That's correct, two minutes and 15 seconds.

MEMBER CORRADINI: So does that, so to ask my question, if I delayed on the reactor water level reduction and it went beyond 90 seconds, but I successfully had the slick initiation much early because -- Is there a compensation in behavior or do once I pass that point the oscillatory power --

MR. BROADBENT: No. The impact of reducing reactor water level is predominant. That reduces the core power significantly, recognize when you initiate slick there is still like a couple minute time delay before the slick actually enters the vessel because it's got to go through all the piping then it's got to mix in the vessel and get up to a concentration where it can affect reactivity, so the level reduction is the more important operator action.

MEMBER CORRADINI: Thank you.

MEMBER SKILLMAN: I have a question, Frank.

MR. WEAVER: Sure.

MEMBER SKILLMAN: When this video began we

had two people on watch, quietly on watch, and a third that we couldn't see.

MR. WEAVER: Right.

MEMBER SKILLMAN: What was the indication that this was an ATWS? How did they know that? I mean if they were sitting there knowing when it was coming then they are predispositioned.

MR. WEAVER: Right. Okay.

MEMBER SKILLMAN: What was it at the beginning that confirmed to them this is no nonsense, this is ATWS?

MR. WEAVER: Right. The RPS system initiated, which told the crew, the control board operator, that RPS had actuated and that all rods should go in.

His immediate operator reaction is to confirm all control rods have inserted.

MEMBER SKILLMAN: Okay.

MR. WEAVER: But you punch one button and you look at the --

MEMBER SKILLMAN: Rod positions.

MR. WEAVER: -- rod positions on the control, they spring.

MEMBER SKILLMAN: Okay.

MR. WEAVER: And that tells him

immediately that RPS is actuated and all rods are not in, so that tells him he's in an ATWS.

MEMBER SKILLMAN: Understood.

(Simultaneous speaking)

MR. WEAVER: Then you look at the APRM meters and you could look at the digital readouts and it will tell you what core thermal power is at that time.

MEMBER SKILLMAN: Now I understand, thank you.

MR. COUTU: So those are the first actions the operators take in any trip scenario.

MEMBER SKILLMAN: Right, I understand.

MR. COUTU: Immediately.

MEMBER SKILLMAN: Okay.

MEMBER BANERJEE: So I have a slightly different question. This 90 seconds, or whatever that number, is a calculated number, right, that you have to meet?

MR. WEAVER: That's correct.

MEMBER BANERJEE: How much uncertainty is in that number?

MR. BROADBENT: Well that's a conservative number based on the worst case state point on the power flow map or the worst case core exposure and all that, you know, recognize that we're not going to be operating

1 at that Point Delta, you know, routinely.
2 MEMBER BANERJEE: Yes, but the calculation
3 is done?
4 MR. BROADBENT: Right.
5 MEMBER BANERJEE: And based on that?
6 MR. BROADBENT: Right.
7 MEMBER BANERJEE: What is the uncertainty
8 in that calculation?
9 MR. BROADBENT: Well the analysis was done
10 for 90 seconds. We didn't do any uncertainty analysis
11 to see exactly how high we could go. One hundred and
12 twenty seconds was too high for us.
13 MEMBER BANERJEE: What happened at 120
14 seconds?
15 MR. BROADBENT: We exceeded the PCT limit
16 and then we would have to, which is acceptable in an
17 ATWS, but then it introduces other issues, so we wanted
18 to stay below the 2200 degrees.
19 MEMBER BANERJEE: Are you going to
20 actually show us some of these calculations later?
21 MR. BROADBENT: I think -- Well the
22 calculations that are part of the licensing basis are
23 in the license amendment.
24 MEMBER BANERJEE: Yes, but are you going to
25 discuss these at all in the closed session?

1 MR. BROADBENT: We weren't planning on
2 discussing any sensitivity evaluations or anything like
3 that.
4 MEMBER CORRADINI: But I think what Sanjoy
5 is getting to is a question I was waiting for because
6 I thought it was going to be in the presentation
7 somewhere, which is PCT, an exceedance of PCT is your
8 figure of merit --
9 MR. WEAVER: Right.
10 MEMBER CORRADINI: -- and what is the
11 uncertainty in some of those models that drive you to
12 an uncertainty in the timing? Do you understand my
13 question?
14 MR. BROADBENT: Yes, that would have to be
15 in the closed session because that gets into uncertainty
16 in GE's methodology and --
17 MEMBER CORRADINI: But I think that's
18 where Sanjoy is going.
19 MEMBER BANERJEE: Exactly. I mean
20 there's a question of, I don't even want to speak of it
21 in open session.
22 MEMBER SCHULTZ: I thought I saw some
23 slides, and I presumed they would be in the proprietary
24 session that were, the closed session, that at least
25 would shed some light on this topic.

1 MEMBER BANERJEE: Yes.
2 MR. WEAVER: Okay.
3 MEMBER SCHULTZ: And then show some ranges
4 of --
5 MEMBER BANERJEE: With rewetting and Tmin
6 and --
7 (Simultaneous speaking)
8 MR. BROADBENT: Okay.
9 MEMBER BANERJEE: We need to get into this
10 in --
11 (Simultaneous speaking)
12 MR. BROADBENT: Okay. You're getting
13 into the whole Tmin issue, yes.
14 MALE PARTICIPANT: Yes.
15 (Simultaneous speaking)
16 CHAIR REMPE: But out of -- Just to
17 reemphasize, you know 120 seconds is too long, 90
18 seconds works, did you try 100 seconds?
19 MR. NADEAU: Yes, we did have information
20 like that. I'd prefer to talk about it in closed
21 session.
22 CHAIR REMPE: Okay.
23 MEMBER BANERJEE: Also, I guess the thing
24 that concerns us, of course, is that this is a higher
25 power density core than we've seen before so we need to

1 understand where this comes from exactly.
2 MR. BROADBENT: Well recognize we have,
3 you know, additional uncertainties that we've added, at
4 least on the CPR side to address the high power density,
5 you know, in the MELLLA+ range.
6 MEMBER BANERJEE: Right, through the CPR
7 side.
8 MR. BROADBENT: Right.
9 MEMBER BANERJEE: But this is a --
10 MR. BROADBENT: On the ATWS side is what
11 you're talking about, okay.
12 MEMBER BANERJEE: The ATWS side. Okay,
13 we'll take it up later.
14 MR. WEAVER: All right. Any other
15 questions? So just to wrap up for the simulator
16 evaluations and the audit that the Commission performed
17 in October, we met the time critical actions.
18 I'd like to reemphasize that before we are
19 approved we will test each crew for proficiency on
20 meeting all the time required actions. Then if
21 approved those time critical operator reactions will
22 become what we call critical tasks in evaluated
23 simulator scenarios such that if those time critical
24 operator reactions are not met then it is a crew failure,
25 not an individual failure.

1 The entire crew will fail and they will be
2 removed from license watch standing duties and before
3 they can go back on watch they would have to be
4 remediated and retested successfully to meet those time
5 critical actions.
6 MEMBER SCHULTZ: And that remains a
7 condition of your license?
8 MR. WEAVER: A license condition.
9 CHAIR REMPE: But this is going to be just
10 in time testing, but then I heard a few minutes ago you
11 said that well we are going to do some testing on the
12 simulator and provide that information to the
13 Commission before this is approved.
14 MR. NADEAU: Yes, I'll be talking about
15 that in my next section. We'll weigh into it.
16 CHAIR REMPE: Okay.
17 MR. WEAVER: Okay. Any other questions
18 for me? Thank you for your time. I will turn it over
19 to Mr. Jim Nadeau who will talk about license changes.
20 Okay, Jim.
21 MR. NADEAU: So, thanks. I'm Jim Nadeau,
22 I'm the Regulatory Assurance Manager.
23 CHAIR REMPE: Just for everyone, I think we
24 should go ahead and continue at least this section. We
25 were supposed to have lunch at noon, but we'll at least

1 do this next 15 minutes and then we'll see where we're
2 at, right. Okay. Sorry, go ahead.
3 MR. NADEAU: Okay. Again, Jim Nadeau,
4 Regulatory Assurance Manager at Grand Gulf, and
5 obviously from our first analysis section in the
6 operator section we want to talk about what are we going
7 to do with our license and our licensing documents.
8 So I'm going to go through the changes we're
9 going to make in our operating license, they are
10 technical specifications. Then I'm also going to talk
11 about the testing we're going to do to confirm that we're
12 ready to operate in the MELLLA+ region.
13 All right, so we have some operating
14 restrictions. What the operating restriction
15 basically says is we will not operate in the MELLLA+
16 region if we have one of these two conditions, and that's
17 either reactor recirculation system single loop
18 operation or feedwater heater out-of-service.
19 That will be covered in our updated Final
20 Safety Analysis Report and will be translated into our
21 procedures.
22 We talked about time critical actions that
23 Frank ran us through and also on the analysis. We are
24 going to train, these are all license commitments that
25 are covered in our updated Final Safety Analysis Report.

1 We are going to train the crews. They have to meet the
2 criteria.
3 We will report to the NRC within 60 days
4 showing the results of that and all three of those time
5 critical actions that we talked about, the 90 seconds,
6 300, and the 660 seconds, will all be confirmed in that
7 report, and that has to be done prior to operating in
8 the MELLLA+ region.
9 MR. COUTU: Just to be sure, I believe in
10 the opening statements it was alluded to the fact that
11 we would have that done prior to approval of MELLLA+,
12 prior to implementation just to be clear.
13 CHAIR REMPE: Okay. That's what I was
14 going to, thank you.
15 MR. NADEAU: Thanks, Tom. Technical
16 specification changes, on the next couple slides I'm
17 going to go through the tech spec changes but I will talk
18 also about our core operating limit report.
19 So increasing the minimum value discharge
20 pressure of the standby liquid control system pump, Greg
21 was talking earlier that that would go up approximately
22 30 psig.
23 Change in the allowable value for power
24 range monitor flow by a simulator thermal power, this
25 is to support the new analysis in the new flow range and

1 power range.

2 The rise in the reactor protection system,

3 tech specs pertaining to accelerating power range

4 monitor upscale trip function. This aligns the trip

5 function with our new analysis.

6 Basically, you don't want the trip function

7 inside the new approved MELLLA operating domain.

8 And the last one, we're eliminating the

9 surveillance requirements that's no longer required by

10 the proposed DSS-CD reactor core stability solution.

11 Additional tech spec changes, rotating the

12 core operating limits reports, this is necessary for all

13 --

14 MEMBER BANERJEE: So when are you

15 implementing the DSS-CD, the stability solution, is it

16 already?

17 MR. NADEAU: Yes. The one that we're, the

18 revision that we're using for MELLLA+ will be

19 implemented concurrent with the MELLLA+ approval.

20 MEMBER BANERJEE: All right. But you

21 implement that first and then you start to go into the

22 MELLLA+ region, right?

23 MR. NADEAU: Yes. We --

24 MEMBER BANERJEE: What does concurrent

25 mean?

1 MR. NADEAU: We can get approval to operate
2 in the MELLLA+ domain, which we would modify all our
3 license procedures, license conditions and procedures,
4 prior to operating in the MELLLA+ domain, but we have
5 to --
6 (Simultaneous speaking)
7 MR. NADEAU: Yes. We have to prove --
8 MEMBER BANERJEE: That this works.
9 MR. NADEAU: Yes.
10 MEMBER BANERJEE: All right. Before
11 going to that region, if you have --
12 MR. NADEAU: That's fine.
13 MEMBER BANERJEE: Where is it now? Have
14 you got everything ready and waiting to go, the
15 solution?
16 MR. NADEAU: The DSS-CD, we have it ready
17 and waiting to go. We have submitted it to the NRC and
18 it's one of the documents in the approval process.
19 MR. BROADBENT: Yes, and as a matter of
20 fact, you know, we have Option 3 and the confirmation
21 density solution has jumpered out right now, so the
22 design change is just removing those jumpers and
23 activate that capability.
24 MR. NADEAU: We'll be adding a new
25 technical specification, administrative section,

1 that's going to, basically it's new reporting
2 requirements.
3 If we're inoperable for OPRMs how we
4 report, you know, the cause, what we're going to do about
5 it, the plan, and it's just a change in the reporting
6 requirements.
7 Update the applicable reference in
8 technical specification administrative sections, this
9 is going to cover all the different new reports in the
10 DSS-CD and things to get the references correct.
11 And we'll be decreasing the analyzed peak
12 containment pressure from 14.8 psig and 12.1 psig.
13 Going through the analysis we were able to look at
14 compartment pressures and come up with a lower pressure,
15 so we're going to incorporate that as part of this.
16 MEMBER SKILLMAN: Jim, how will the tech
17 spec handle the core operating limit report required
18 changes for potential field changes, six, eight cycles
19 in the future?
20 MR. NADEAU: A new core operating limit
21 report is required every time we go to a fuel cycle. So
22 if we're changing the fuel, obviously that's what you're
23 thinking, we're going to change the fuel type or
24 whatever, we would have to re-analyze for that fuel type
25 and come up with a new core operating limit report for

1 that particular cycle.

2 MEMBER SKILLMAN: Okay, thank you.

3 MR. BROADBENT: Using GE's approved G-Star

4 methodology.

5 MEMBER SKILLMAN: Okay, thank you.

6 CHAIR REMPE: It's interesting you've

7 decreased the peak containment pressure, because didn't

8 in one of your analysis the pressure significantly

9 increased with the MELLLA+ regime for the peak

10 containment pressure?

11 MR. NADEAU: I can't --

12 MR. BROADBENT: It increased for EPU, but

13 not for MELLLA+. For MELLLA+ it came down from 14.8 to

14 12.1.

15 CHAIR REMPE: I thought that there was

16 some, one of the transients that I saw in one of the RAIs

17 that it actually had gone from like 6.4 psig up to

18 12-something or other, but I'll look that up over lunch

19 and see it.

20 MR. BROADBENT: Okay, sure.

21 CHAIR REMPE: Yes.

22 MR. BROADBENT: I mean it may have been a

23 non-limiting event or something like that.

24 CHAIR REMPE: Yes. I'll look for it.

25 MR. NADEAU: Any more questions -- Sorry?

1 MR. JACKSON: On reactor systems and
2 didn't know the answer to that. We have a containment
3 systems reviewer here if you had a specific question.
4 CHAIR REMPE: I'll look for it at lunch,
5 but I had it dated, it was from 09/19/14, and I'll look
6 for it and I'll have more information.
7 MR. JACKSON: Okay. We can address your
8 question. I'm sorry I didn't have the answer though.
9 CHAIR REMPE: Okay.
10 MR. JACKSON: The look of fear on my eyes
11 when you look over --
12 MR. SALLMAN: Okay. Ahsan Sallman from
13 Texas --
14 CHAIR REMPE: Can he help me remember what
15 I saw?
16 MR. SALLMAN: Yes. In the EPU analysis
17 the peak containment pressure went up to 40 point
18 something --
19 MALE PARTICIPANT: Eight.
20 MR. SALLMAN: -- and when the MELLLA+ was
21 analyzed they de-evaluated the volume below that steam
22 flow, so that volume increased.
23 CHAIR REMPE: Yes.
24 MR. SALLMAN: So because of increase of
25 that volume the heat in the vent well came out, so that's

1 why the, I think -- Is that correct?

2 MR. WEAVER: That's correct.

3 CHAIR REMPE: Okay. I must have been

4 confused, but I'll check it.

5 MR. SALLMAN: It's the volume change that

6 affected that pressure.

7 CHAIR REMPE: Okay. Go ahead.

8 MR. WEAVER: All right, so any more

9 questions on the tech spec changes? Okay. Just --

10 MEMBER SCHULTZ: Just a point of

11 clarification of, back to the operator training one more

12 time.

13 You indicated the training cycle will be

14 done over all the crews and then a report will be

15 provided within 60 days.

16 MR. WEAVER: That's correct.

17 MEMBER SCHULTZ: Is the, will the report be

18 filed before you go into MELLLA+ regime?

19 MR. WEAVER: Yes.

20 MEMBER SCHULTZ: Thank you.

21 MR. NADEAU: Okay. The next section I

22 want to talk about is the prescribed testing that we have

23 to get into the MELLLA+ domain.

24 We talked about moisture carryover

25 earlier. Moisture carryover tests will use

1 methodology similar to our initial moisture carryover
2 test to confirm our analysis results and that it's
3 performing the way we want it to.
4 MEMBER BANERJEE: So you said you'd
5 perform more but you didn't tell us like what the
6 frequency or how often you might do it during this period
7 when you get into MELLLA+, the MELLLA+ region.
8 How many tests are we talking about here,
9 two, three, one?
10 MR. NADEAU: I'm going to have to get back
11 to you on that one.
12 MEMBER BANERJEE: It would be nice to know
13 what your plans are.
14 MR. NADEAU: Yes.
15 MEMBER BANERJEE: I don't think it's
16 particularly critical, but, nonetheless.
17 MR. NADEAU: The power range monitors,
18 we're going to have our calibrations, trips, alarms, and
19 rod blocks all confirmed and make sure it's overlooking
20 where we want them.
21 We'll validate our core performance --
22 MEMBER SCHULTZ: Can you describe further
23 what you're, well I guess maybe you were going to
24 describe further what you mean by that, validating your
25 core performance?

1 What testing are you going to do there other
2 than what you would normally do?
3 MR. BROADBENT: Nothing other than what we
4 would normally do. We would make sure that the COLR
5 reflects the correct operating limits for MELLLA+ and
6 that we have enough margin to move over into the MELLLA+
7 region and that type of stuff, okay.
8 MR. NADEAU: That's correct. This core
9 was designed to be able to operate in MELLLA+.
10 MR. BROADBENT: Right.
11 MR. NADEAU: We currently did our testing
12 starting up, confirmed the COLR, when we go into MELLLA+
13 we'll be duplicating those tests, you know, thermal
14 power, fuel margins, things like that, confirm them,
15 same tests, and make sure that we're ready to go into
16 MELLLA+.
17 MEMBER SCHULTZ: Thank you.
18 MR. NADEAU: First, the regulator
19 controller response, water level control response, and
20 neutron flux noise surveillances, these will all be used
21 to confirm our analysis.
22 MEMBER SKILLMAN: How do you do that? Do
23 you do that at power, 50 percent power, do you time, do
24 you bleed off energy so that you have what looks like
25 a runback to determine what the controller is going to

do?

How do you do pressure regulator controller response?

MR. WEAVER: We can actually, for a pressure reg we can go and do step changes on our main turbine pressure controls, and for reactor water we can go into our digital feedwater control system and do step changes up or down in the feedwater --

MR. BROADBENT: That's prescribed to be, you know, a certain number of inches and then we look at the response and how quickly it adjusted and then --

MEMBER SKILLMAN: So it is actual physical plant testing on plant hardware?

MR. WEAVER: That's correct.

MEMBER SKILLMAN: And a confirmation with a procedure and a sign off and that type of thing?

MR. WEAVER: Yes.

MEMBER SKILLMAN: Yes, sir, thank you.

MR. NADEAU: Okay. Other questions on this slide? All right, that ends my presentation.

CHAIR REMPE: Okay. So we're at a point which is on the agenda at a later point in the day, about the end of the opening session with the licensee.

MR. ALAN WANG: Yes.

CHAIR REMPE: And my understanding is from

1 now on the rest of the sessions will be closed, so this
2 is a good time to ask for public comments, because when
3 we come back after lunch we will have closed sessions.
4 Unless any of the members have any more
5 questions that are open questions -- Actually, just for
6 my clarification, what is the status with respect to the
7 fuel?
8 What's exactly in the plant at this time?
9 Is it all GNF2 fuel?
10 MR. NADEAU: All GNF2.
11 MR. BROADBENT: Yes.
12 CHAIR REMPE: When did that start
13 actually, was that with the EPU and I have forgotten?
14 MR. BROADBENT: I mean it's been over the
15 last few cycles, so the last at least two cycles were
16 GNF2 reload batches and probably the last, you know, the
17 one before that because we got about a 40 percent batch
18 fraction, so probably the last three reloads were GNF2.
19 CHAIR REMPE: Okay.
20 MEMBER SKILLMAN: I think when we did the
21 EPU it was partial.
22 CHAIR REMPE: That's what I was just trying
23 to remember.
24 MEMBER SKILLMAN: So it's been since 2012
25 --

1 MR. BROADBENT: Yes.
2 MEMBER SKILLMAN: -- you've unloaded all
3 the 14 now we're in G2.
4 MR. BROADBENT: Right.
5 MEMBER SKILLMAN: Yes.
6 CHAIR REMPE: Yes.
7 MEMBER SKILLMAN: Okay.
8 CHAIR REMPE: Okay, so on the line, Mike,
9 do you have any more questions that are open session
10 questions?
11 MEMBER CORRADINI: No, I'm fine.
12 CHAIR REMPE: Okay. Is there anyone else
13 out there?
14 MR. LEWIS: Marvin Lewis.
15 CHAIR REMPE: Hi, Marvin. Do you have any
16 questions or does anyone else out there on the open line?
17 MR. LEWIS: Yes. I am trying to write
18 this, the fuel damage. How much of a -- Can you tell
19 if any of the fuel is being damaged by these excursions
20 or not?
21 CHAIR REMPE: Actually, I should've
22 rephrased my -- The public is not allowed to ask
23 questions. You need to have it as a comment and we will
24 take that comment into consideration, okay.
25 MR. LEWIS: Thank you.

1 CHAIR REMPE: Anyone in the audience here
2 have any comments? Okay. So what I'd like to do if
3 everyone, the Staff and the licensee are agreeable to
4 it, is take a break and come back at one o'clock with
5 a closed session. So at this point we'll --
6 MR. WEIDONG WANG: I want to suggest the
7 closed session until 1:15 because the lines are for 1:15
8 we've set up for the closed line, yes.
9 CHAIR REMPE: Oh, okay. So we do need to
10 take a longer lunch hour and come back at 1:15, but we're
11 still ahead of schedule so that will be fine with
12 everybody. Thank you.
13 (Whereupon, the above-entitled matter was
14 adjourned at 11:45 a.m.)
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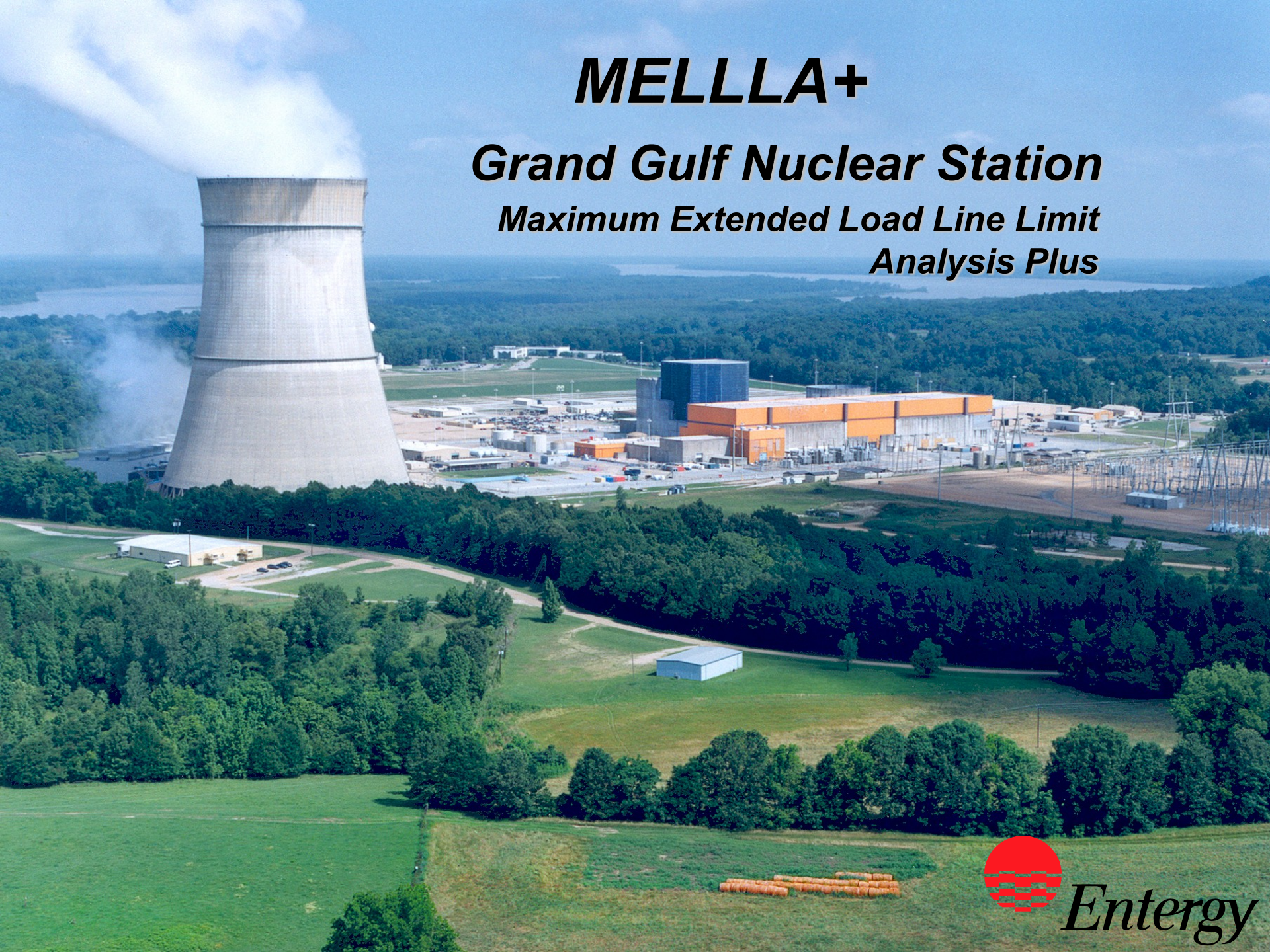
MELLLA+

Grand Gulf Nuclear Station

Maximum Extended Load Line Limit Analysis Plus



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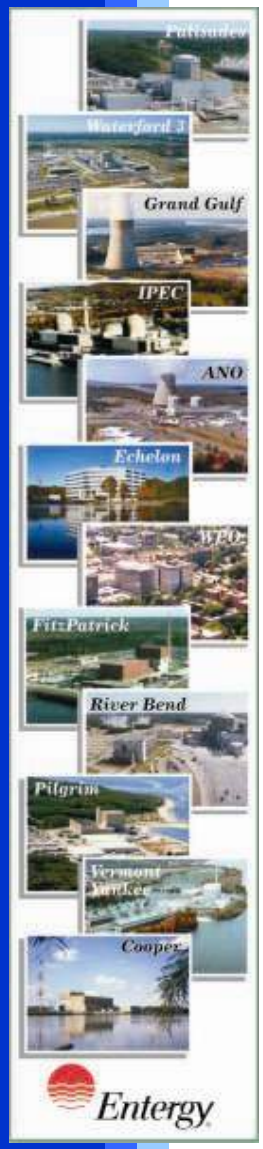
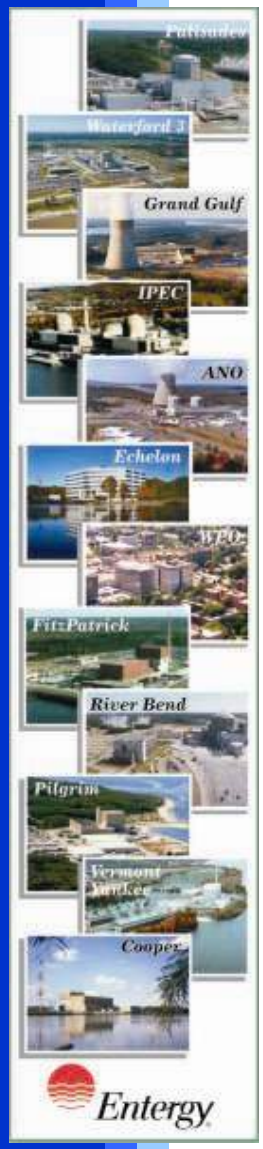


Grand Gulf Nuclear Station Maximum Extended Load Line Limit Analysis Plus

Advisory Committee on Reactor Safeguards

MELLLA+ Subcommittee Meeting

March 17, 2015

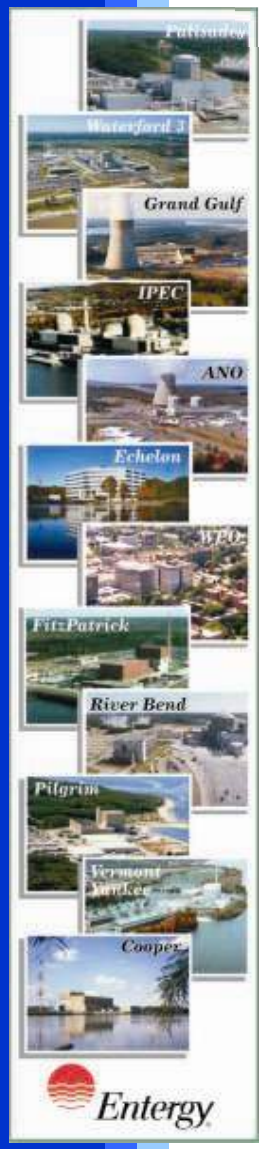


Introduction

Thomas Coutu

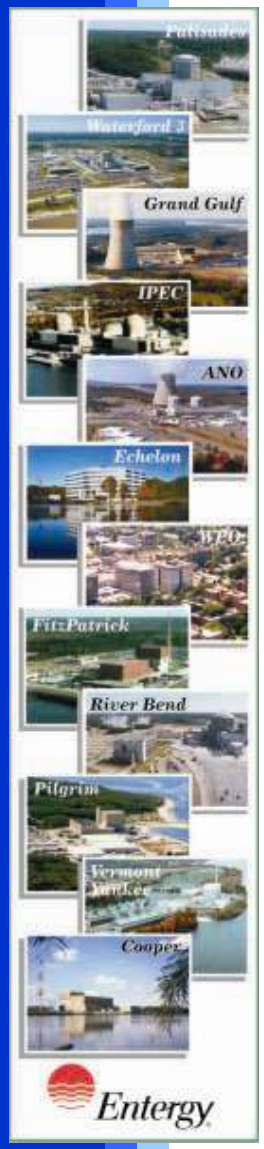
Director, Performance Improvement And Regulatory Assurance GGNS

Entergy ACRS Subcommittee Presenters



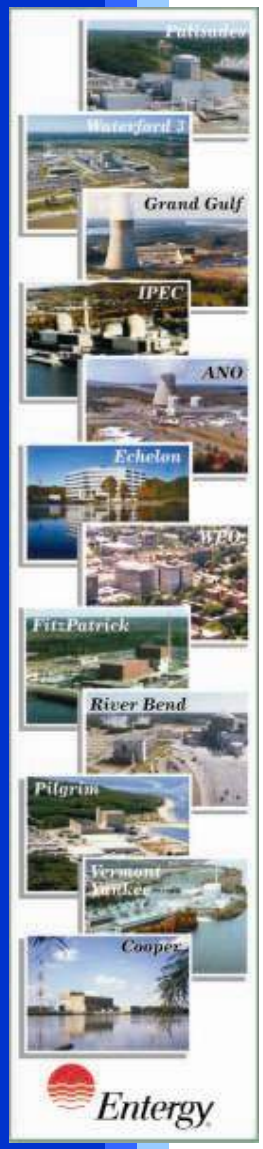
- **Thomas Coutu– Director, Performance Improvement And Regulatory Assurance GGNS**
- **Greg Broadbent– Supervisor, Fleet Nuclear Analysis Entergy**
- **Frank Weaver– Operations Shift Manager GGNS**
- **James Nadeau – Manager, Regulatory Assurance GGNS**

GGNS MELLLA+ Support



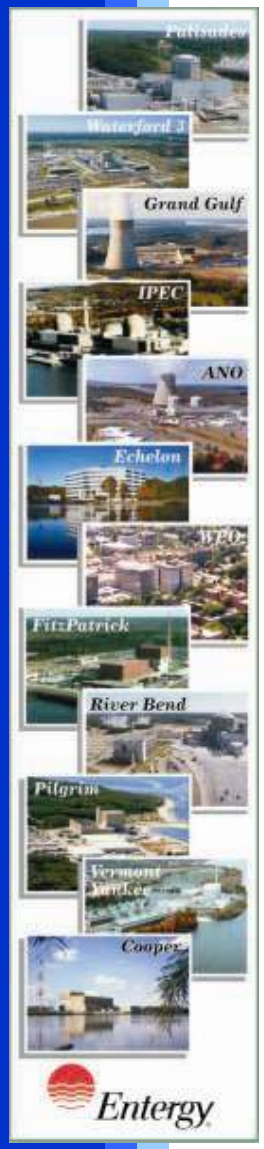
- Fleet Senior Manager — Bryan Ford
- Fleet Licensing Mgr. — Guy Davant
- Design Eng. Mgr. — Thomas Thornton
- Regulatory Assurance — Richard Scarbrough
- Training Supervisor — Richard Liddell
- GEH Project Director — Larry King
- GEH Transient Analysis — Michael Cook
- GEH Stability Analysis — Juswald Vedovi

AGENDA



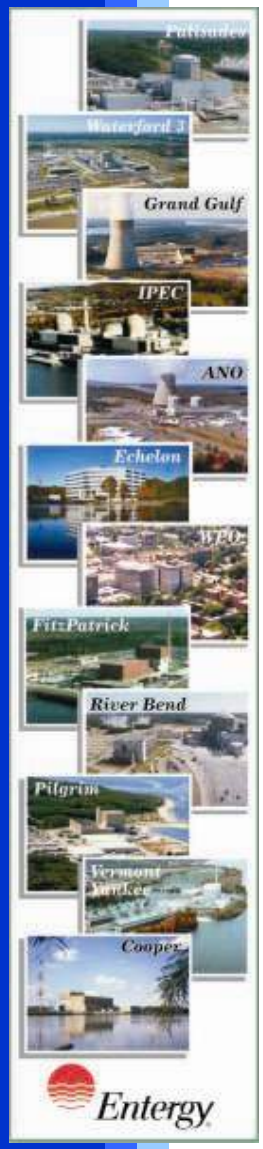
- Overview
- Benefits
- Analysis
- Operator Training
- Operating License Changes

Grand Gulf Nuclear Station Overview



- GE BWR 6 - Mark III Containment
- Operating License Issued November 1, 1984
- Commercial Operation Began July 1, 1985
- OLTP Limit 3833 MWt
- CLTP Limit 4408 MWt

MELLLA+ Benefits

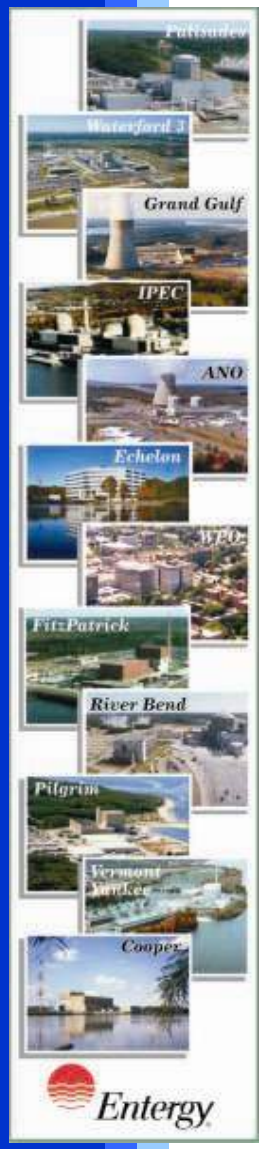


Improved Operational Flexibility

Increased flow region compensates for reactivity reduction due to fuel depletion

- Broader core flow range at rated power
- Fewer number of rod pattern changes per cycle
  - Reduced Reactivity Manipulations
  - Reduced Operator Challenges
  - Improved Fuel Efficiency

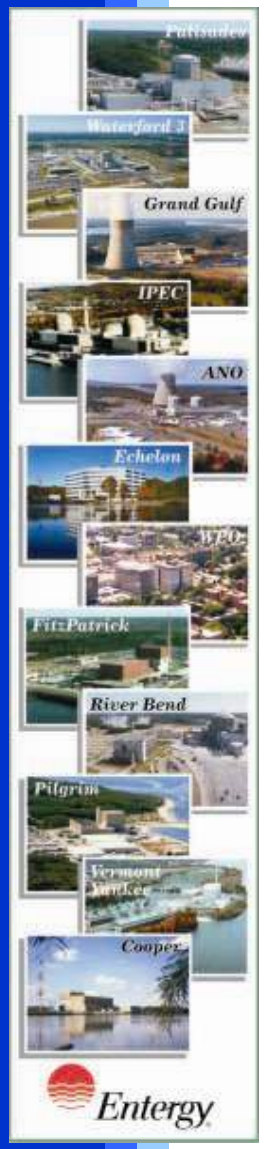
MELLLA+ Impacts

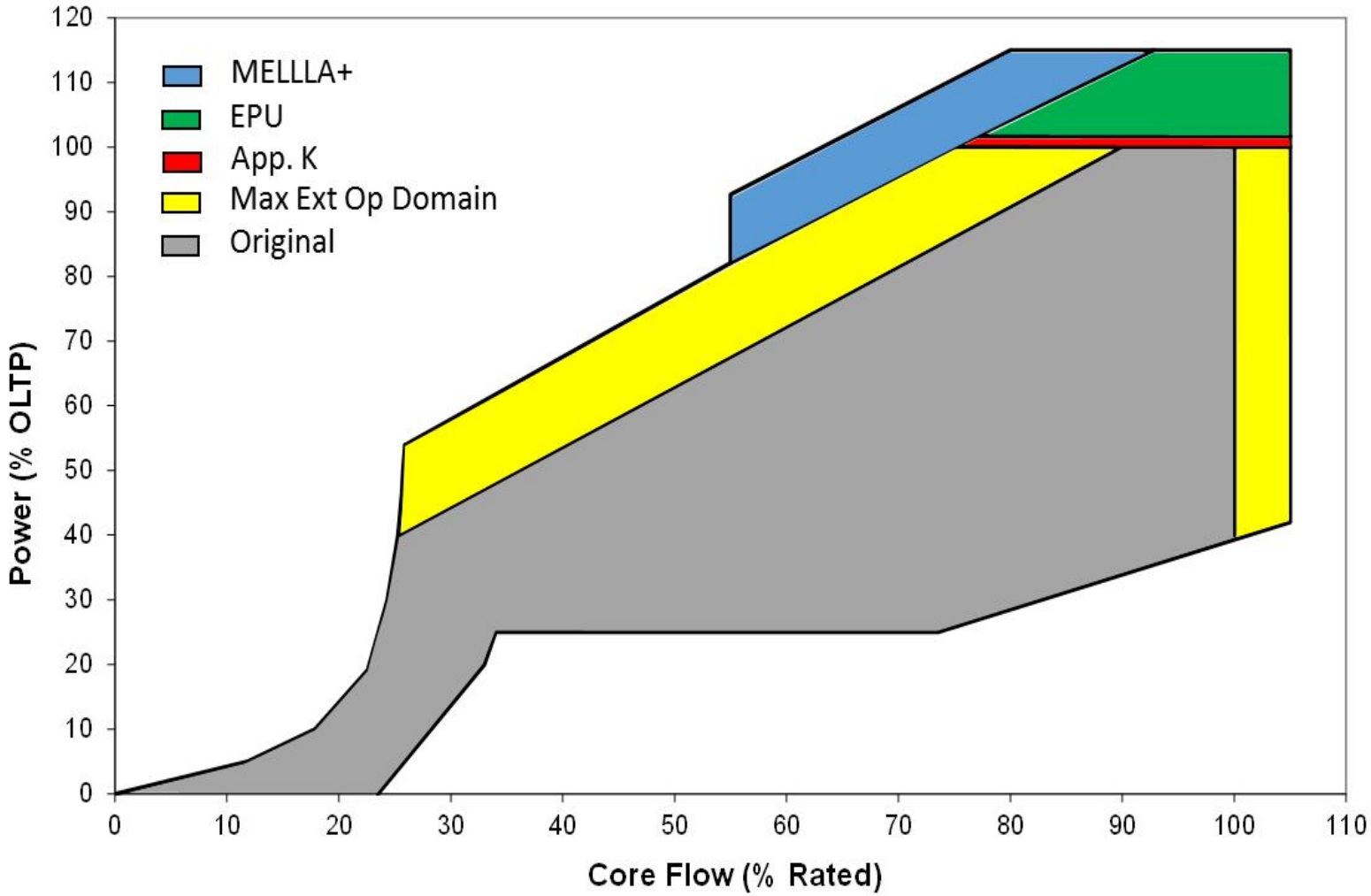


No Change To:

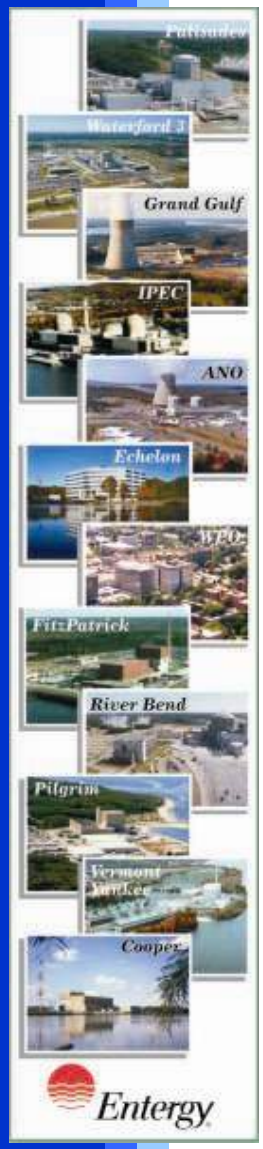
- **Maximum licensed power level**
- **Maximum licensed core flow**
- **Maximum licensed vessel dome pressure**
- **Balance of Plant Equipment**

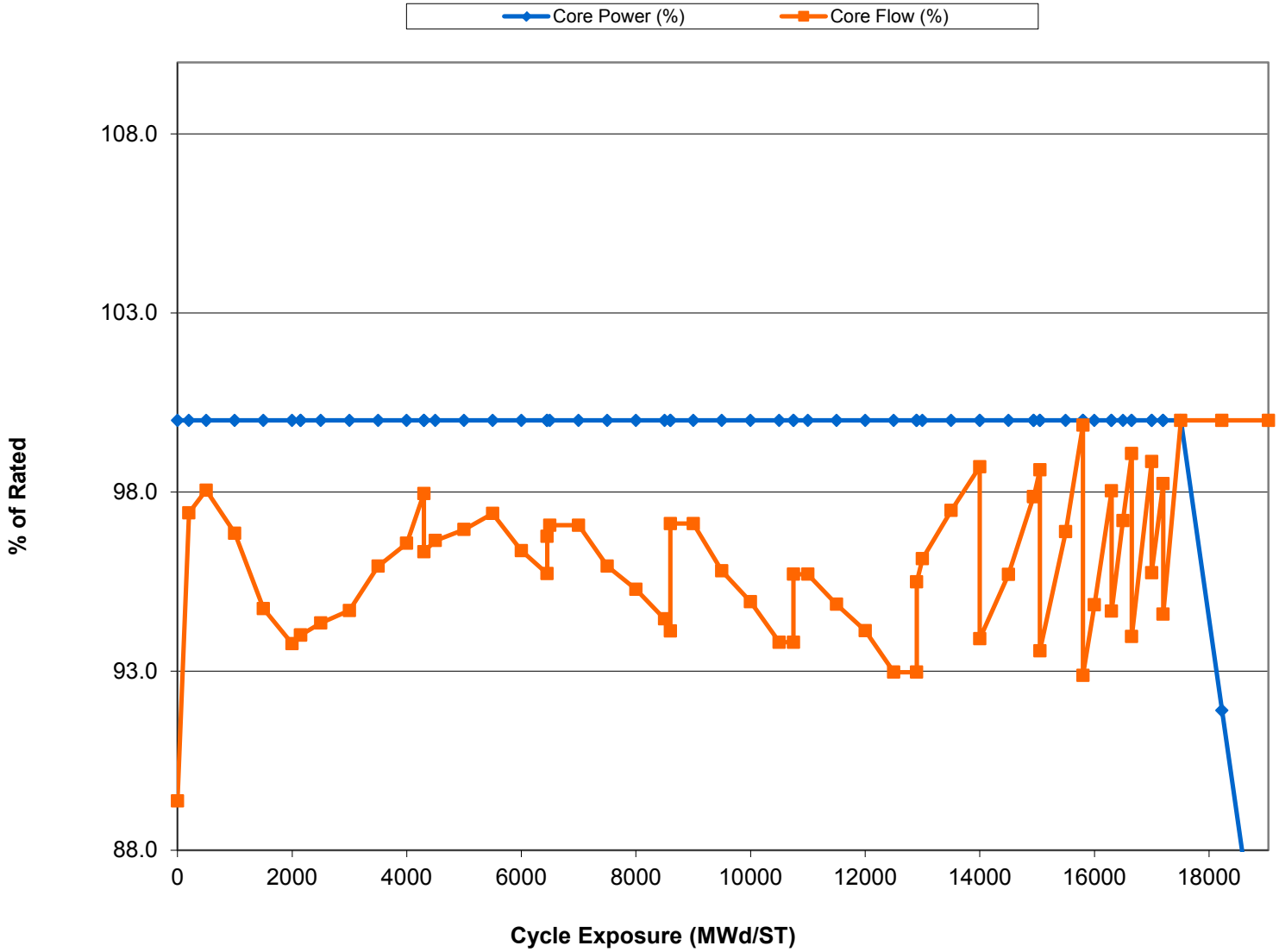
GGNS Power/Flow Map



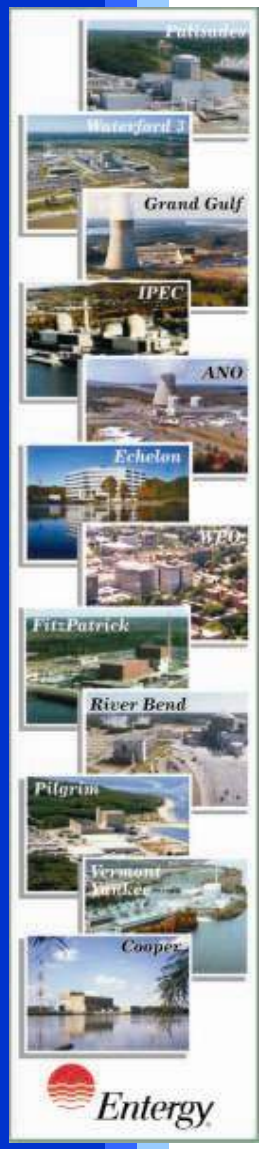


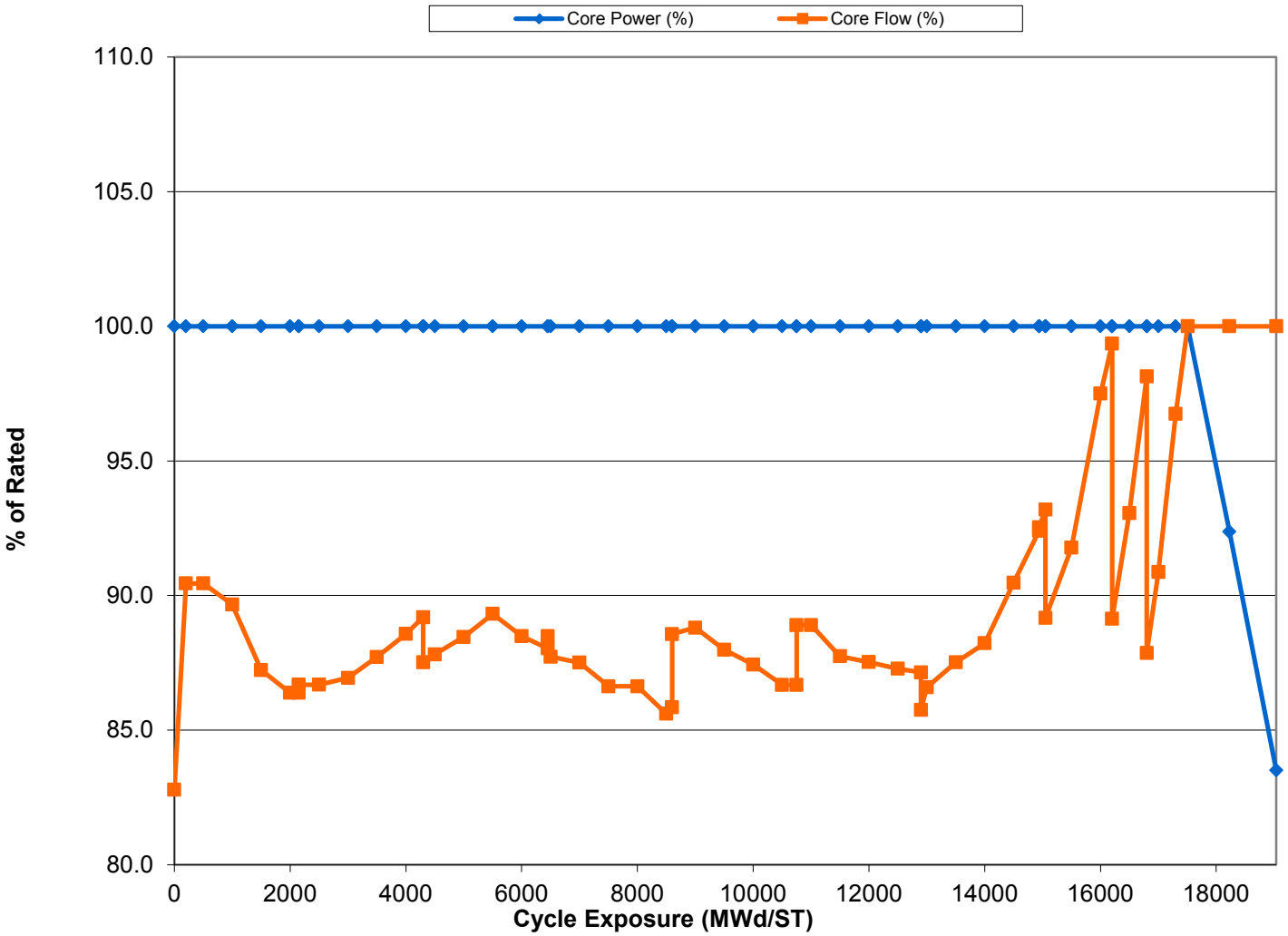
C21 Core P/F – All MELLLA

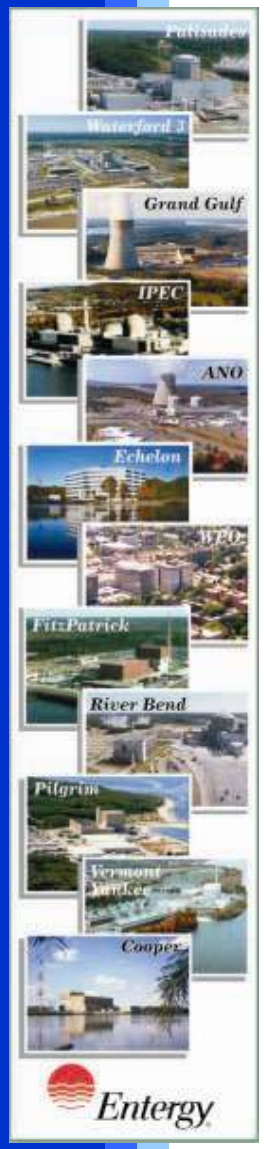




C21 Core P/F – All MELLLA+







Analysis

Methods

Results

Moisture Carryover

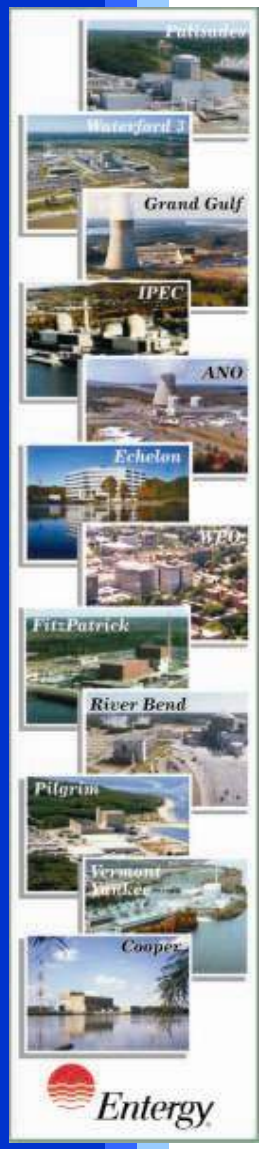
Min. Critical Power Ratio

Analysis Methods

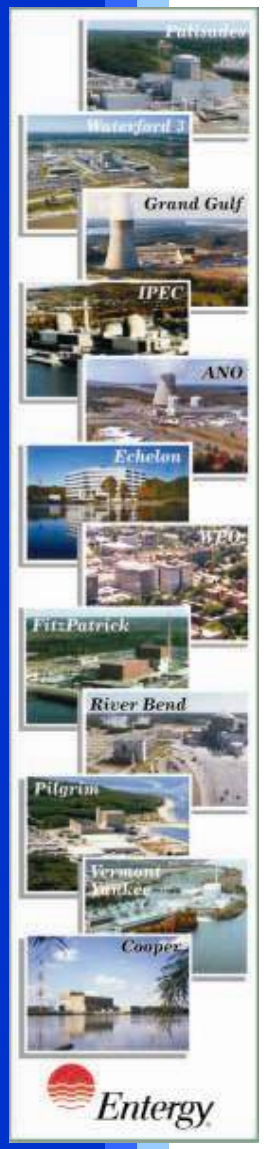
- **Implemented latest LTR revisions**
  - **MELLLA+ LTR NEDC-33006 P-A**
  - **Methods LTR NEDC-33173 P-A**
  - **DSS-CD LTR NEDC-33075 P-A**
  - **TRACG LTR NEDC-33147 P-A**

- **Met all Limitations and Conditions**

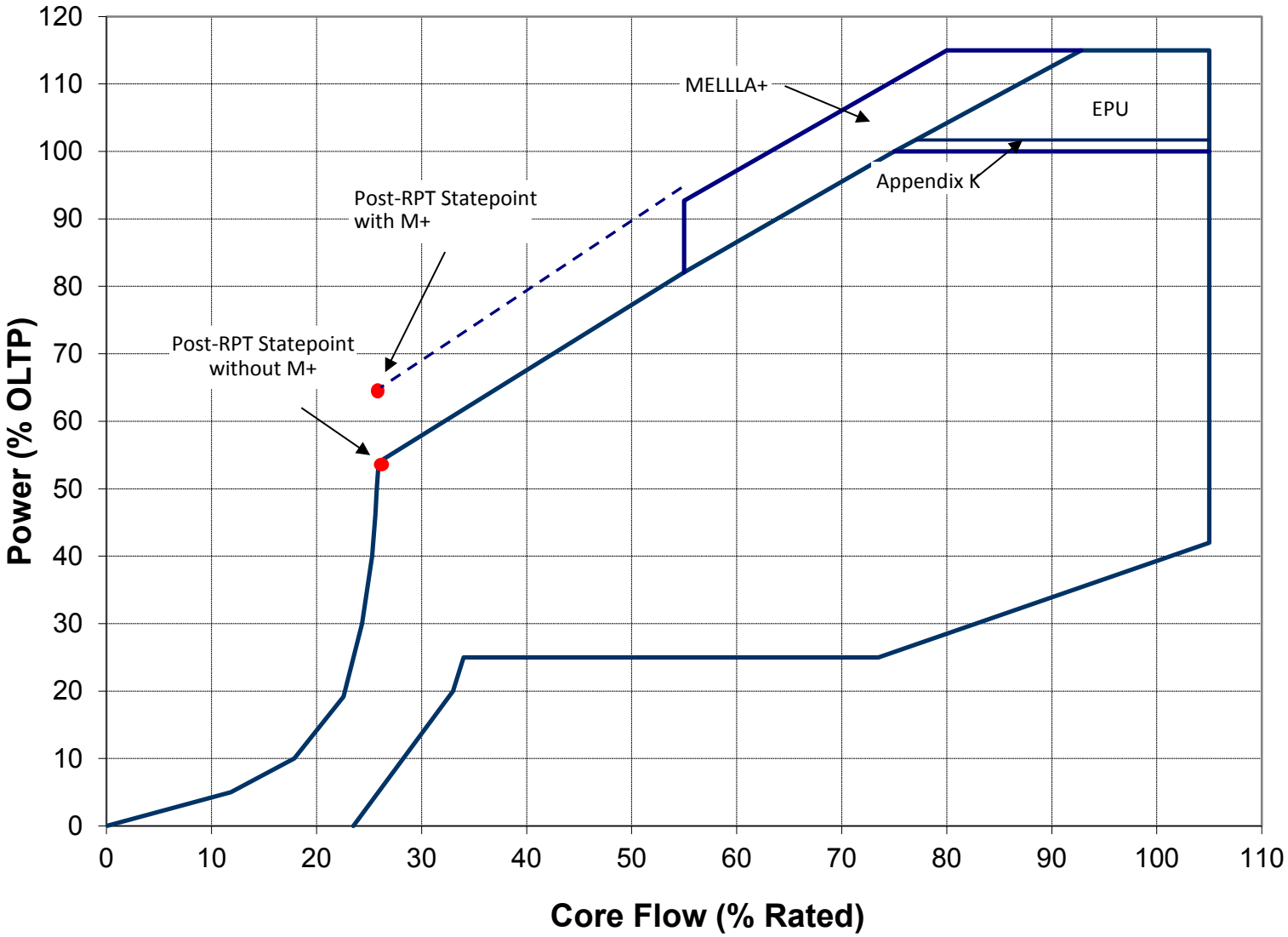
Analysis Results



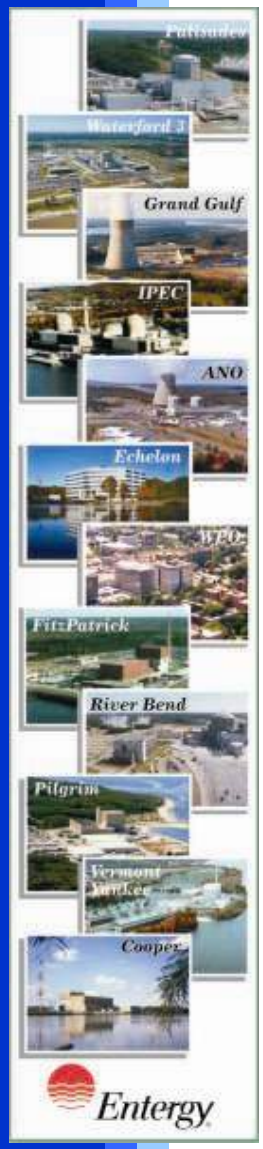
- Negligible Impacts to Most Analytical Inputs
  - Operating Dome Pressure
  - Steam and Feedwater Flow
  - Core Power
    - Decay Heat
    - Source Terms
- Small Changes to core performance
  - Captured in Operating Limits in COLR
- Largest Changes and Impacts
  - Post-ATWS Power Levels
  - Moisture Carry-Over



MELLLA+ Power/Flow Map



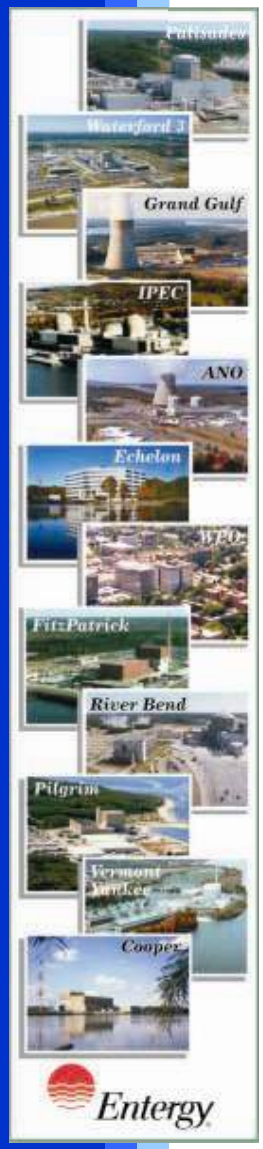
Plant Specific Evaluation



Evaluation of MELLLA+ LTR NEDC-33006P-A

- Operation in the MELLLA+ Region Results in a Higher Post-RPT Power Level in the Event of an ATWS
- Operator Action Required to Initiate Reduction of Reactor Water Level Within 90 Seconds of Recirculation Pump Trip following an ATWS

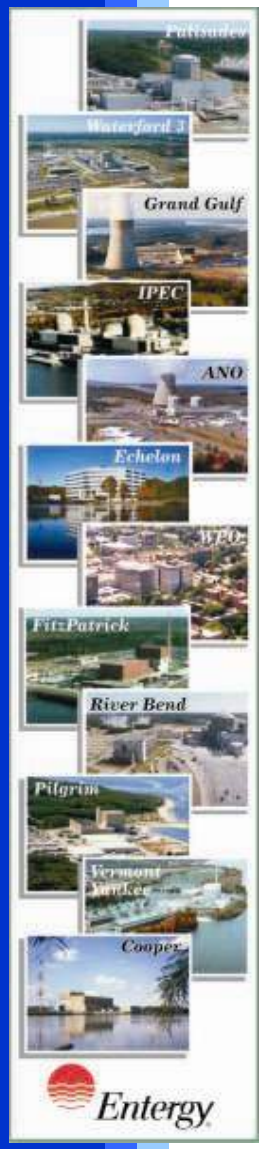
Plant Specific Moisture Carryover Evaluation



MCO Predicted to Increase in the M+ Region

- From peak of 0.069% (CLTP) to 0.194% (M+)
- MCO Limit is 0.33%
- Additional Moisture in Steam Affects:
  - Effluent Releases
  - Steam Line Components
  - Flow Accelerated Corrosion Program
- Affect of Additional Moisture has been Analyzed
- Actual MCO to be measured under M+ startup tests
  - Recently measured MCO = 0.0158%

MELLLA+ SLMCPR LTR Limitations

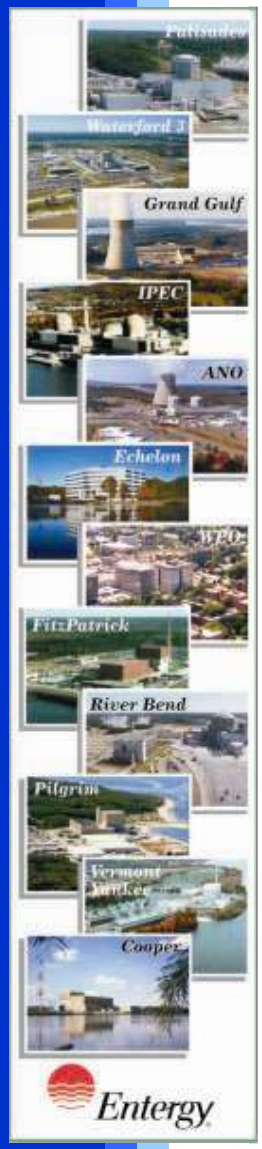


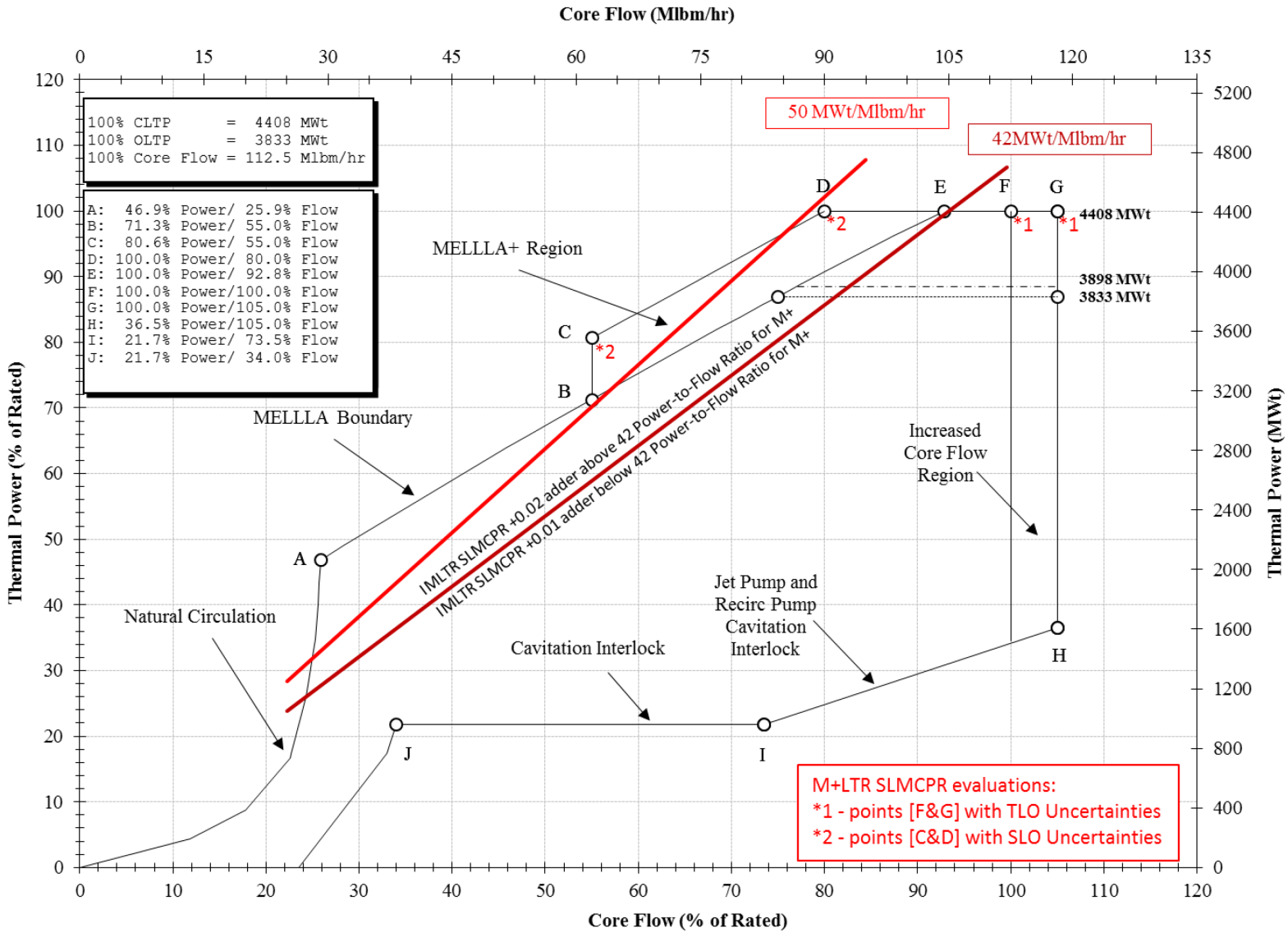
- **IMLTR (NEDC-33173) Limitation**
  - **+0.01 adder for <42 MW/Mlb/hr**
  - **+0.02 adder for >42 MW/Mlb/hr**

- **MELLLA+ LTR (NEDC-33006) Limitation**
  - **M+ statepoints apply SLO core flow uncertainty**

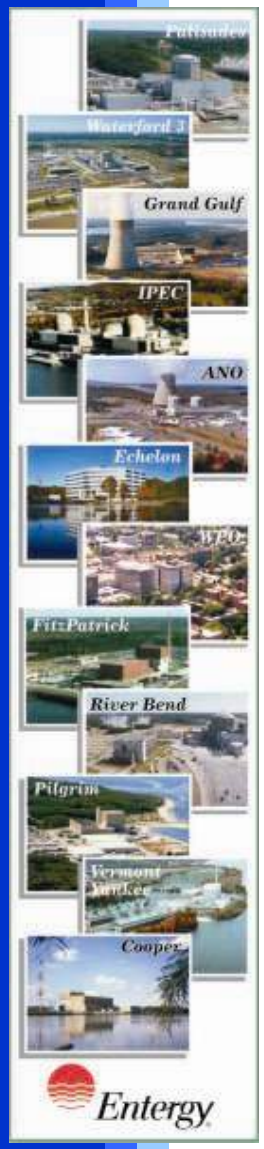
- **IMLTR (NEDC-33173) Limitation**
  - **Perform power distribution assessment to establish that neutronic methods axial and nodal power distribution uncertainties have not increased.**

Summary Illustration





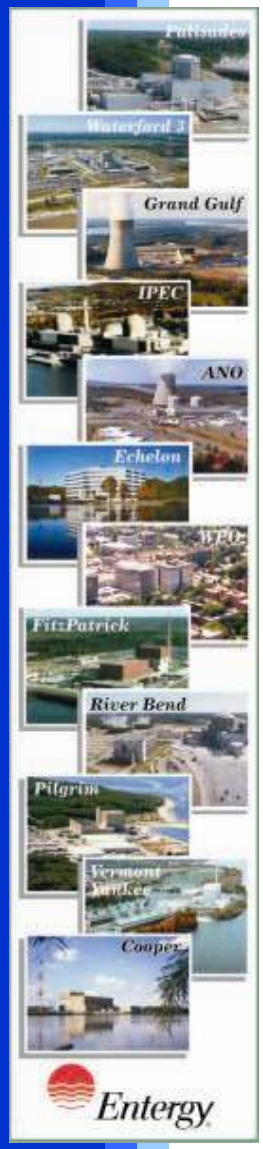
Grand Gulf EPU/MELLLA+



TLO SLMCPR Components

	Current Non-M+	M+	Comment
Calculated Pts E,F,G	1.09	1.09	
Calculated M+ Pts C,D		1.13	+0.04 from SLO CF uncertainties
IMLTR Penalty	0.02	0.02	>42 MW/Mlb/hr
Adjusted SLMCPR	1.11	1.15	
Tech Spec Limit	1.11	1.15*	

* MELLLA+ SLMCPR submitted under separate license amendment.

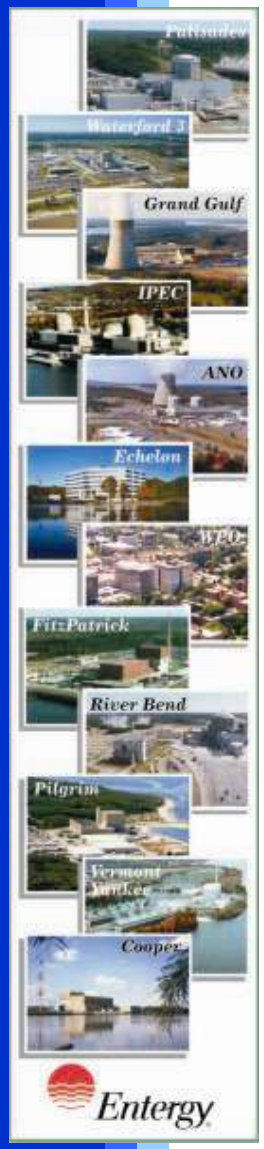


Operator Training

Time Critical Operator Actions

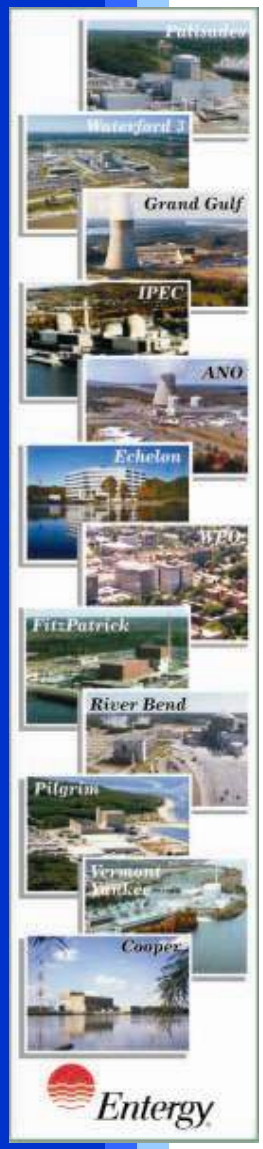
Simulator Audit Results

ATWS Time Critical Operator Actions



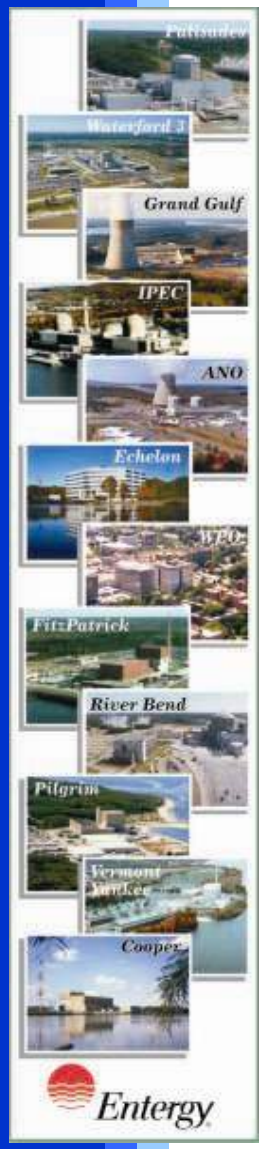
TCOA	MELLLA+
Initiate Reactor Water Level Reduction	90 Seconds
Initiate Standby Liquid Control Injection	300 Seconds
Initiate Suppression Pool Cooling	660 Seconds

GGNS Simulator Audit



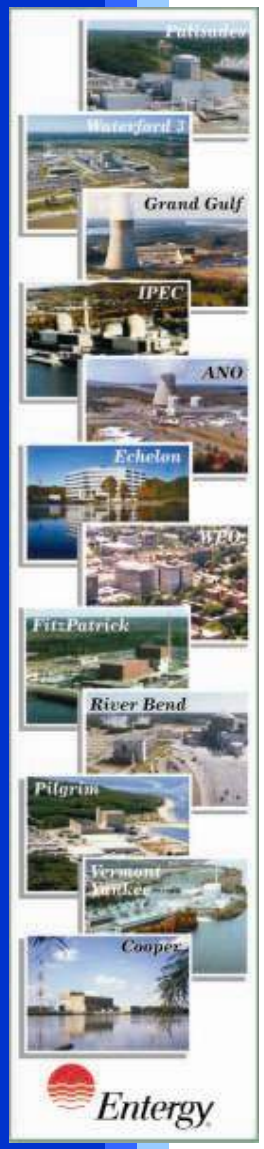
- Audit performed by NRC Staff in October 2014
- The transients were initiated at 100% CLTP and 80% recirculation flow, which is the most limiting MELLLA+ condition.
- Audit demonstrated 90 second operator/plant response to Full Power ATWS Scenarios:
  - Turbine Trip with Bypass (TTWBP)
  - MSIV Closure (MSIVC)

Simulator Video



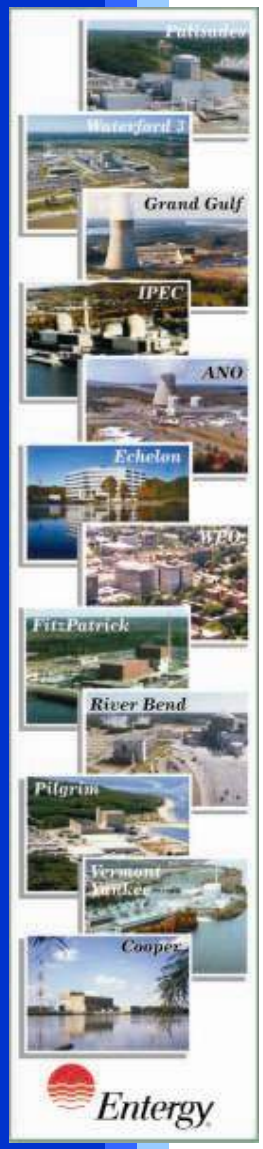
- On separate media

GGNS Simulator Audit Results



- For all the transients analyzed, the time to initiate water level reduction took significantly less than the 90 seconds allowed by the analyses.

- Operators promptly and effectively followed the EOPs.



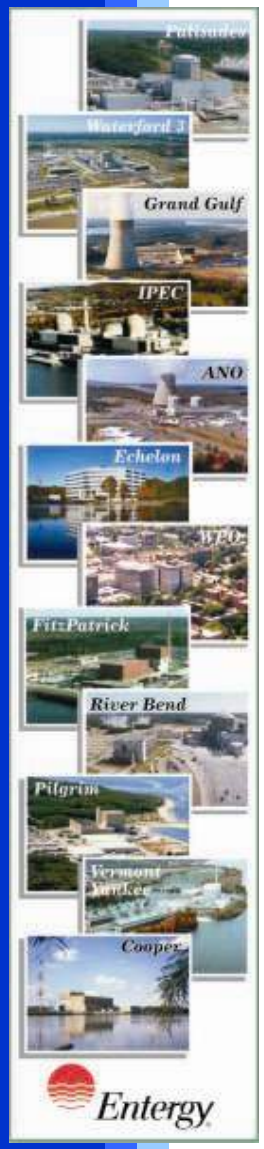
MELLLA+ Operating License Changes

Restrictions

Tech Spec Changes

Testing

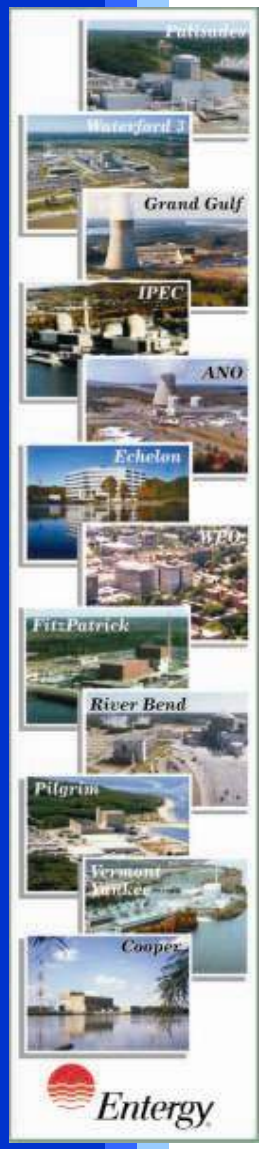
Operating Restrictions



Operation in the MELLLA+ domain is prohibited when operating with the following plant configurations:

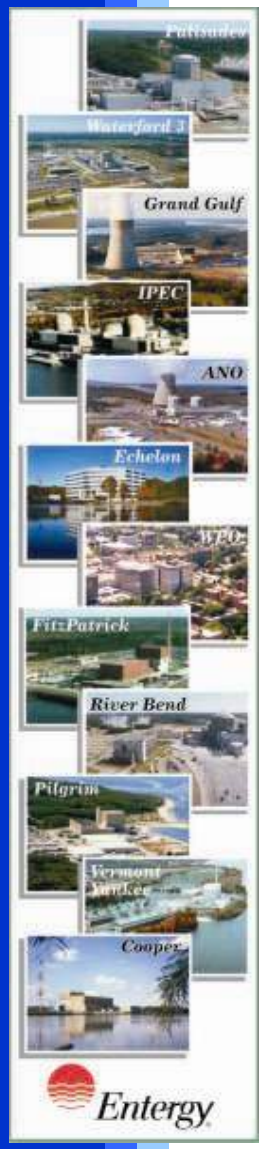
- **Reactor Recirculation System Single Loop Operation (TS LCO revision)**
- **Feedwater Heaters Out of Service (License Condition)**

Time Critical Actions



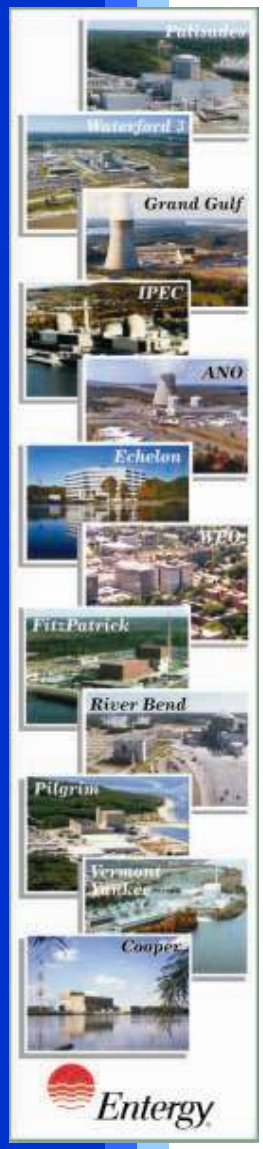
- Train Operating Crews on the Time Critical Operator Actions
- Report Results to the NRC PM within 60 days
- Time Critical Operator Actions (License Condition)
  - Initiate Reduction of Reactor Water Level within 90 seconds of both Recirc Pump Trips during ATWS
  - Initiate Standby Liquid Control Injection within 300 seconds of ATWS
  - Initiate Suppression Pool Cooling within 660 seconds of ATWS

Tech Spec Changes



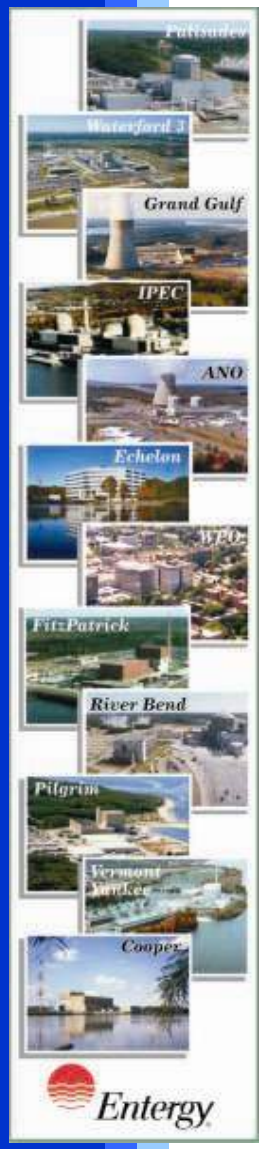
- Increasing the minimum value discharge pressure for the Standby Liquid Control (SLC) System pump
- Changing the Allowable Value for APRM Flow Biased Simulated Thermal Power – High trip function
- Revising the *Reactor Protection System (RPS)* TS pertaining to the OPRM upscale trip function
- Eliminating Surveillance Requirement that is no longer required by the proposed DSS-CD reactor core stability solution

Tech Spec Changes (cont.)



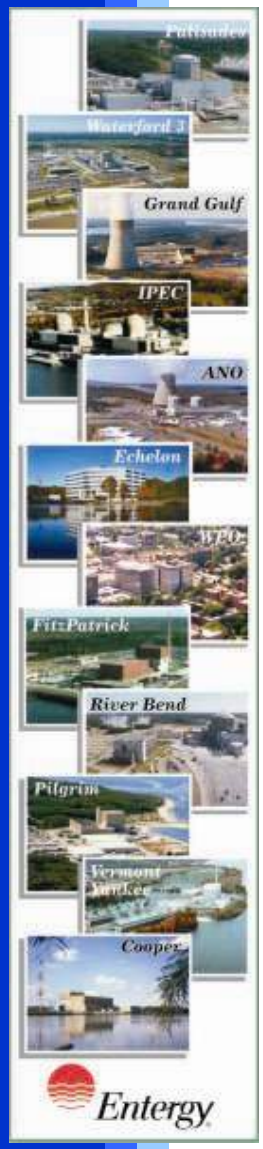
- Updating Core Operating Limits Report based on the new analysis
- Adding new TS Administrative Section specifying the content for the new OPRM reporting requirements
- Updating the applicable references in TS Administrative Section 5.0
- Decreasing Analyzed Peak Containment Pressure from 14.8 psig to 12.1 psig

Prescribed Testing

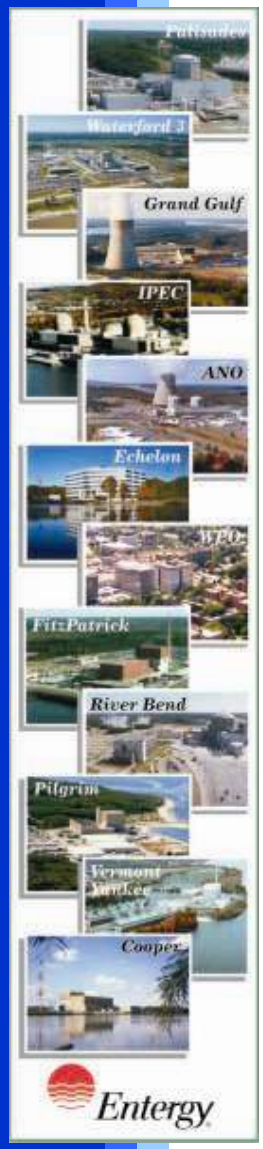


- Moisture Carryover
- APRM Trips, Alarms and Rod Blocks
- Core Performance
- Pressure Regulator Controller Response
- Water Level Control Response
- Neutron Flux Noise Surveillance

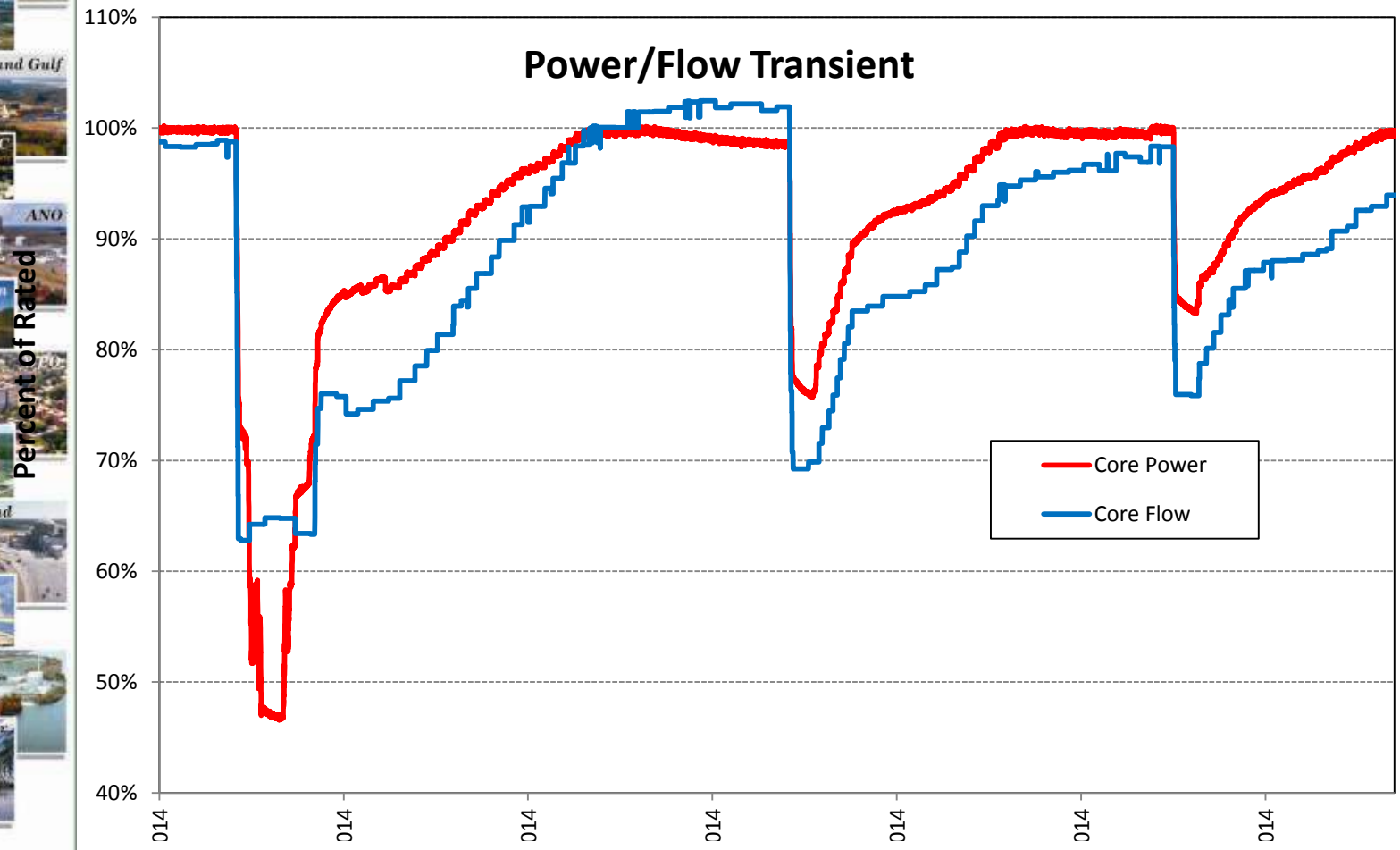
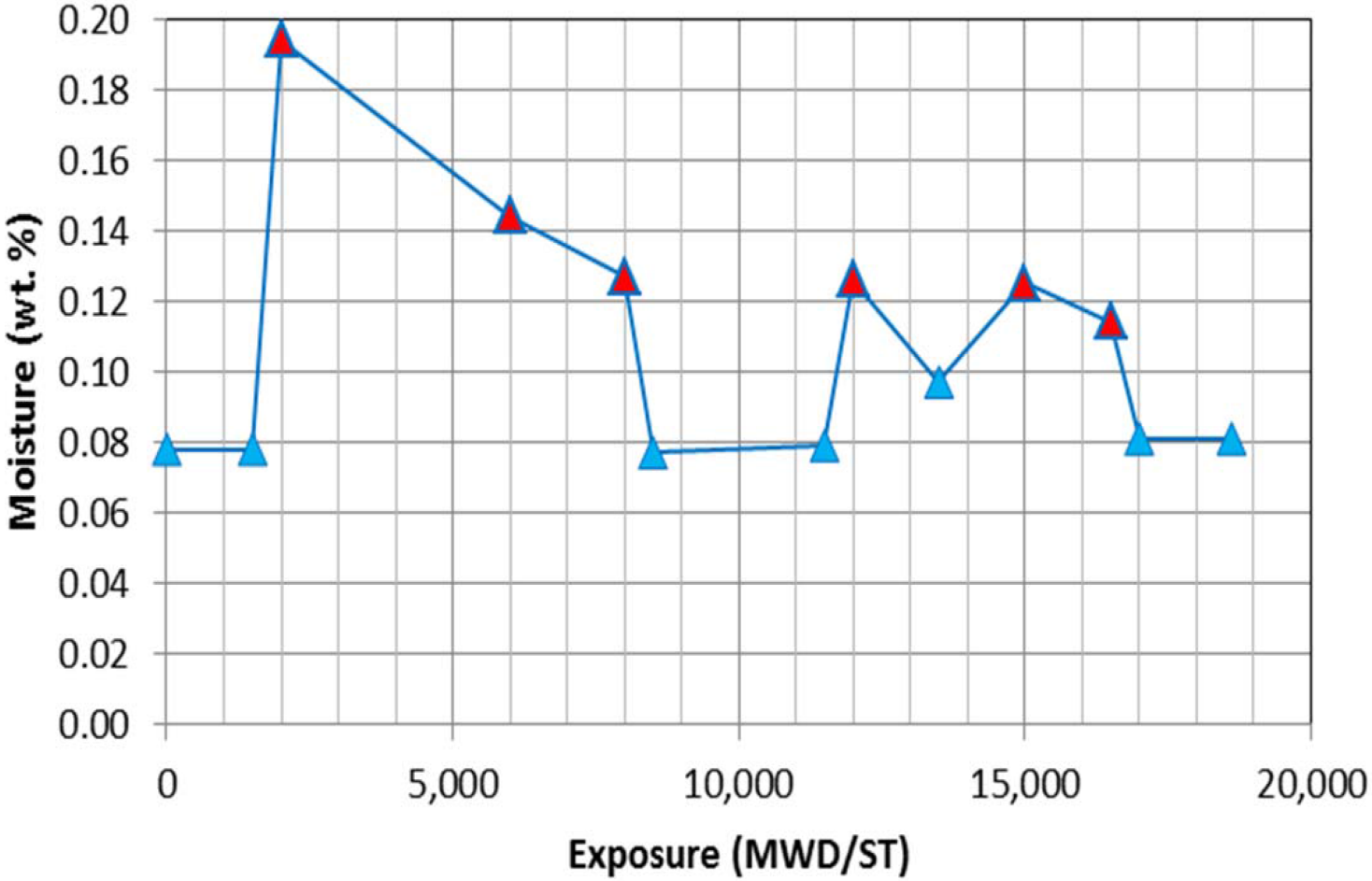
End of Open Session



Extra Slides



Recent Rod Pattern Adjustment Power Profile



MCO Variation