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NUCLEAR REGULATORY COMMISSION

Title: Hearing ITMO Entergy Nuclear

Docket Number: 50-271-OLA; ASLBP No.: 04-832-02-OLA

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Location: Newfane, Vermont

October 11, 2006 (4:07pm)

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Date: Wednesday, September 13, 2006

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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ATOMIC SAFETY AND LICENSING BOARD PANEL

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HEARING

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In the Matter of: :

ENTERGY NUCLEAR VERMONT :

YANKEE L.L.C. and : Docket No. 50-271-OLA

NUCLEAR OPERATIONS INC., : ASLBP No. 04-832-02-OLA

(Vermont Yankee Nuclear :

Power Station) :

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Wednesday, September 13, 2006

The above-entitled hearing was convened, pursuant to notice, at 9:00 a.m. at the Windham County Superior Court, 2nd floor Courtroom, 7 Court Street, Newfane, Vermont.

BEFORE:

ALEX S. KARLIN, Chair

ANTHONY J. BARATTA Administrative Judge

LESTER S. RUBENSTEIN Administrative Judge

APPEARANCES:

On Behalf of the Licensee:

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ALSO PRESENT:

MARCIA CARPENTIER, ESQ., ASLBP Staff

RICK ENNIS, Project Manager, NRC

CRAIG NICHOLS, Project Manager, Entergy

KAREN VALLOCH, ASLBP Staff

DR. JORAM HOPENFELD

I-N-D-E-X

EXHIBIT INDEX

KEY

I-Identified

A-Admitted into evidence

R-Rejected

W-Withdrawn

TUA-Taken under advisement

Official Hearing Document Exhibit #/letter	Title	Disposition/ Page
Entergy 1	Nichols resume	I-1149
Entergy 2	Casillas resume	I-1150
Entergy 3	CP&L	I-1150
Entergy 4	NUREG-0800, section 14.2.1	I-1151
Entergy 5	Entergy Letter attachment 7	I-1151
Entergy 6	Entergy letter attachment BVY 03-80	I-1152
Entergy 7	FSER, pages 267-271	I-1152
Entergy 8	Report No. 0000-0035-6443	I-1153
Entergy 9	LER, May 27, 1999	I-1153
Entergy 10	LER, February 14, 2002	I-1153
Entergy 11	LER, August 4, 2000	I-1154
Entergy 12	LER, May 21, 2001	I-1154
Entergy 13	LER, January 5, 2004	I-1155
Entergy 14	LER, March 24, 2004	I-1155
Entergy 15	LER LER, March 30, 2004	I-1156

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Entergy 16	LER, July 6, 2004	I-1156
Entergy 17	LER, Appropriate 12, 1991	I-1156
Entergy 18	LER, June 6, 1991	I-1157
Entergy 19	LER, July 11, 1991	I-1157
Entergy 20	LER, June 14, 2005	I-1158
Entergy 21	LER, September 22, 2005	I-1158
Entergy 22	Wallis letter, January 4, 2006	I-1159
Entergy 23	Rebuttal exhibit 1	I-1160
Entergy 24	Rebuttal exhibit 2	I-1160
Entergy 25	GE topical report, July 2003	I-1161
Entergy 26	GE topical report, August 1986	I-1162
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Entergy 30P	Report No. NEDC-33004-A	I-1164
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Staff 5	Review Standard 2003	I-1365

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P R O C E E D I N G S

9:02 a.m.

CHAIR KARLIN: Good morning. My name is Alex Karlin, I'm the Chair of the Atomic Safety and Licensing Board Panel.

We would like to begin, this morning, by introducing ourselves and this matter, and then we will ask the parties to introduce themselves, and then talk about some procedural and preliminary matters.

Under the Atomic Energy Act, and the regulations of the Nuclear Regulatory Commission, the law, the statutes established Atomic Safety and Licensing Board panels, such as ourselves, to hear evidentiary hearings in disputed matters in licensing proceedings.

And so the three of us have been appointed to this particular Board, in accordance with that law and those regulations. This is the matter, I want to get this on the record of the Entergy Nuclear Vermont Yankee, LLC, and Entergy Nuclear Operations, Inc., have applied for a license amendment.

The docket number in this case is 50-571-OLA, and it is an application, by Entergy for a 20 percent uprate in the power for their nuclear facility down in Vernon, Vermont.

For the record today's date is the 13th of September, and our proceeding is being held in the Windham Superior Court in Newfane, Vermont.

To my left is Dr. Anthony Baratta, a PHD in nuclear physics. And he is the associate Chief Judge of the Atomic Safety and Licensing Board Panel. To my right is Lester Rubenstein, who has spent 40 years in technical and managerial matters associated with the nuclear field, and he started with the Atomic Energy Commission, which is the predecessor to the Nuclear Regulatory Commission, in 1967.

As I said, my name is Alex Karlin, and my training is that of a lawyer. I spent 30 years practicing law before coming here and being a judge on this panel, with the Atomic Safety and Licensing Board Panel.

I'd like to introduce our other staff here today. To my right here is Marsha Carpentier, she is a lawyer, she is the law clerk to the Board and helps us with legal, and other matters, to try to sort things out.

To my far right here is Andy Willkie, he is handling something called the DDMS, it is an electronic system that we are trying to develop and use.

Karen Valloch is sitting in the back, she is our administrative assistant, and is helping with things. We have, in the far back, Cindy Harbaugh, who is in charge of our security matters. And if you have any questions about that, and also I think I will mention Diane Scrinchi, who is a public affairs officer. If there is a question from anyone I think she may be able to help you with that.

We also have Mr. Ballala, who is our bailiff, serving as our bailiff today, thank you. And Cristina Willis, I believe, who is our Court Reporter, and she will transcribe this matter.

If we could, now, just have the parties, if you would, introduce yourselves, starting over on the left with Entergy.

MR. TRAVIESO-DIAZ: Good morning, Mr. Chairman, members of the Board. My name is Matias Travieso-Diaz, I'm a partner of the law firm of Pillsbury Winthrop Shaw Pittman LLP, we are counsel to Entergy Nuclear Vermont Yankee LLC, and Entergy Nuclear Operations, Inc., in this proceeding.

With me, to my right, is Scott Vance, who is an associate at our firm.

CHAIR KARLIN: Good morning, thank you. Mr. Turk, or Mr. Hamrick?

MR. HAMRICK: Thank you, Mr. Chairman. My name is Steven Hamrick, from the Office of General Counsel for the NRC. I'm representing the NRC Staff in this matter.

With me, to my right, is my colleague, Sherwin Turk, also from the office of General Counsel.

CHAIR KARLIN: Good morning. Mr. Shadis?

MR. SHADIS: Good morning. My name is Raymond Shadis, a representative for the New England Coalition. With me, and to my right, is Dr. Hopenfeld one of the Coalition witnesses.

CHAIR KARLIN: Good morning. Thank you. Now we will have a little bit, we will talk about, a little bit, about how we will proceed today, and a little background.

Most parties are familiar with this but, perhaps, some members of the public, it might be of some use to them. Before proceeding I would like to thank the Windham Superior Court. Mr. Larry Robinson is the Clerk of the Court here, in charge. And he has been very helpful.

Also we have Judge John Wesley, this is his courtroom, so I have talked with him, and much appreciate that he has given us the opportunity to use this beautiful and historic courtroom. So we are very thankful for that.

Before we start I would like to talk about three preliminary matters. We are here to conduct an evidentiary hearing under the regulations of the NRC, and it is Part 2, 10CFR Part 2, subpart 11, I'm sorry, L.

And this is the first time there has been a subpart L hearing conducted under the regs as they changed in January of 2004.

I might note, these microphones we have here are for the use of the Court Reporter, they are not actually a public address system. So our voices are not being amplified, I don't think, in here.

So I will try to speak up. If I can't be heard please let me know, and all of us will need to do the same, because this is not an amplification system, this is just for the court reporters to transcribe this material.

So three preliminary matters, if we may. Housekeeping matters, history of the proceeding, and purpose of an evidentiary hearing. Housekeeeping, if you have cellphones, please turn them off, or put them on vibrate.

Media may be here, and they are welcome. I think the rules of this particular courthouse, and we want to try to honor them, is if the media would use the balcony area, apparently that works better for photographs, anyway. That sort of thing would be helpful, and we welcome their presence, ambient light only for any photographs, that is fine.

And the transcript, we will have a transcript made, it will be available ten to fourteen days, to the public, ten to fourteen days after this hearing. And anyone here, or not here, can look at that transcript and see what went on.

History of the proceeding, second item to talk about, briefly. In September of 2003 Entergy applied for this 20 percent uprate. So that is three years ago.

About a year later, in July of '04, the NRC issued a notice in the Federal Register saying that if anyone, that the application had been docketed and that if anyone had any concerns, or objections, that they needed to raise, or they wanted to raise, they need do so within 60 days.

At that time two entities, two parties, brought forth concerns, or contentions. The New England Coalition, who is here today, is a party, NEC, we will sometimes refer to it, raised some contentions.

And, also, the State of Vermont filed some contentions. Thus this Board was appointed to deal with the contentions and try to adjudicate those issues that were raised.

And in October of '04 we came up to Brattleboro and held two days of oral argument, it is called, where we listened to the parties, and their arguments, to determine whether their contentions raised what is known as admissible issues in these proceedings.

Formal rules govern this sort of thing, and we talked about and examined those issues. And we later ruled, in November of '04, that indeed the New England Coalition, and the State of Vermont had raised, each of them, two admissible contentions.

So that was November of '04. At that point the proceeding, essentially, went into abeyance, while the Staff and the Applicant, Entergy, performed certain reports, and did certain materials, such as an environmental impact analysis, and safety analysis to be completed before we could hold this hearing.

And they completed that, in due course, so now we are sort of back on the critical path, trying to address the issues. In June of '04 we were here, in Brattleboro and had what is called a limited appearance statement sessions, three of them, and heard from members of the public, as to their concerns.

And yesterday the three members of the Board, along with our law clerk, went to the Vermont Yankee facility and had a site visit, and we looked at the physical facilities that are the subject of the contention here today.

We did that in the company of representatives of all three parties, so that they could make sure that everything was on the up and up. So we went there together, and we stayed together.

And that was useful, and we appreciate that Entergy made their facility available for that purpose.

Historically, as I said, there were four contentions in this matter. There is only one remaining today. The State had two contentions which they withdrew, and settled, in May or June of this year. So the State of Vermont is no longer a party in this proceeding.

The New England Coalition had two contentions, and recently, in August, they have withdrawn and resolved one of those contentions. And so now we are left with a single contention, or focus, for this hearing.

That doesn't mean it is not important, it is important. That contention, and I will read it to you, so you know what we are going to be asking questions about, is quite short.

The New England Coalition is contending that the license amendment should not be approved unless large transient testing will be a prerequisite to the extended power uprate, and that is what we are here to talk about.

Before we leave history, two points. One is, and we talked about this before, the uprate has already been implemented, hasn't it? And, if so, isn't the game over, and what is this proceeding all about, why are we having this thing?

And the answer is that under the law, and the regs, which we must abide with, as much as anyone, perhaps more than anyone, the Staff of the NRC, which is a separate entity from this Board, we have no separate communications with them, the Staff has concluded that the uprate, in their minds, raised no significant hazards considerations.

It is a term of art, and they made that conclusion. And under those circumstances the Staff and Entergy is able to, Entergy is able to proceed with implementing the uprate prior to the hearing.

But there is still a hearing granted, and this is it. And if at the end of the day, or the end of tomorrow, whatever it is, and we take this back and try to think about it, and issue a ruling, if we decide that the contention was valid, then we can require, or we can issue an order saying so, and the uprate would be conditioned, or possibly subject to the large transient testing that NEC has been asking for.

Second, we are different from the renewal. Everyone knows, I think, that there is a renewal proceeding going on. That is not what we are doing here, this is the uprate. The renewal is a separate board that was up here in August.

And, actually, I'm the Chairman of that board, as well, but we have different technical members, and so it is a very different matter.

Third preliminary point. I appreciate you bearing with me, but the nature and purpose of a hearing, an evidentiary hearing, in a subpart L hearing to be specific, and the purpose of this hearing is for the Board to hear evidence from the parties, on this contention.

And evidence consists of, sort of, two

things. One is the sworn testimony of witnesses. They speak to what they know, and what they saw, and what they did, and that is testimony.

The other component of evidence is documentary, exhibits. So those are the two things. And we are here to hear that evidence. The only people who will speak today are the judges, the lawyers, and the witnesses who are called to the stand.

We are going to use the jury box, over here, for the witnesses, because some of the witnesses will come up in groups. As a matter of fact, most of them will come up in groups.

So rather than trying to use this witness box we are going to use the jury box over there. This is a subpart L hearing, so it is going to be a little different. It is the first subpart L hearing that has ever been held under the new regs.

And let me talk a little bit about that. Several months ago, in May, each of the parties was required to, and they did, submit written testimony, sworn testimony by their witnesses, and exhibits, direct testimony we call that.

So we got piles of materials. A month later, essentially, each party was given the opportunity to submit rebuttal testimony. Witnesses could then, they read what the other side is saying, they then want to rebutt that, they have certain statements they want to make, and, additional exhibits they may want to submit.

That was in June. In July certain motions were entertained to strike certain portions of this material, or not, and we talked with the parties and had a discussion, and we ruled on those motions.

So that was July. In August the parties gave to us proposed questions that they think we should ask the witnesses. And so we have those now, and now we are having the hearing.

The essence of what I just said is that the testimony and the exhibits have already been presented to us, in writing. What is left for today is for us, the Board members, to ask questions of the witnesses. If we have some clarification we need, or something we don't understand, or some inconsistency between what one witness seems to be saying, and what somebody else seems to be saying, and we are concerned about that, we have the chance to ask questions.

This is not like your normal trial where the lawyers ask the questions of the witnesses. Here, essentially, the judges are going to ask the questions.

And this is intended to be, we will see, a more efficient way of doing it. We hope it will be and we are going to do our best to ask the pertinent questions and keep it on track.

Specific procedures for today, we are going to have opening statements. We laid this out in an order, to the parties, and they are pretty familiar with this. But we will entertain opening statements.

Each party will have ten minutes to give us a sort of opening statement of what they think the key points of their case are. Then there will be three minutes for rebuttal.

Each party will be given three minutes to respond, if they wish, to the opening statement of the other two. Ms. Carpentier will help us keep time on that, and I think it shouldn't be a problem, ten minutes and then three minutes.

After that is completed we will then have the direct, as we call it, I will call it, witnesses and exhibits. We are going to go in a sequence.

Entergy will go first because they ultimately have the burden of proof, so they will go first with their witnesses. The NRC Staff will go second, and NEC will go third.

What we will do is ask Entergy to present its witnesses, and its exhibits, and that will take us a few minutes of sort of administrative exhibit filing. They have already filed them to us, but now we need them formally filed for this hearing purposes, and they know how to do that, and it is a relatively straightforward process.

And once the exhibits have been presented, and the witnesses have been empaneled and sworn in over here, then we will ask them some questions. And then the NRC Staff will put theirs on, and we will do the same thing.

Now, this is something a little different in the part of the parties. At the end of going through each round Entergy, NRC Staff, and the New England Coalition, we are going to take a break, a 15 minute break.

And when New England Coalition is done, at that point, if you have any suggestions for supplemental questions you think we should ask the witnesses, any of the witnesses, then you need to submit them to us. We will have a 15 minute break, we will come back and reconvene.

At that point if you have any supplemental questions you think we should ask the witnesses --

now, don't give us the questions you told us to ask before, because we have read all those, and we either have asked them or haven't asked them.

In many cases we will ask the questions you submitted, but we might not use the exact words you gave us. We might have a little different approach to it.

But, anyway, if you have supplemental questions that is the opportunity for you to submit them to us. We will then take those supplemental questions under advisement. Probably take a break.

And you can do it in one of two ways. You can do it in writing, write it down, type it up, scribble it, sign your name to it as counsel, and give them to us, or as representative, Pro Se representative, and give them to us.

If you don't want the other side to know what the questions are going to be asked, that you are suggesting. Or you can just stand up in open court and say, we think that you ought to probe into this issue, and this issue, and this issue.

It will be transcribed, we will take notes, and we will try to get it right. Then we will decide whether or not to ask those supplemental questions, take a break, think about it.

We may have some supplemental questions we want to ask of our own. So we may do a sweep at the end and ask the witnesses for a second round. But that is an opportunity.

There will be no cross examination here today. None of the parties will be conducting any cross examination. But if you have suggestions for us, that is the time to give them to us.

Then we would go through what we might call rebuttal questioning or second round questioning if you suggested something that we think is important, we will ask the witnesses to come back on. Or if we have something that came to us as a consequence of the interplay of the testimony, we will bring them back on and do rebuttal direct questioning.

And we may call up panels concurrently, if there is a reason for two different sets of witnesses to talk, and respond in some way, we may do that concurrent, or simultaneous.

Finally we will also have what is known as proprietary session. And this is something the parties are familiar with but, for the public, it is probably relevant to know.

Proprietary information, what does that mean? Some documents in the possession of some of the parties are proprietary. Most of these are, I think, from Entergy itself. And they are documents which have legal confidentiality associated with them.

They may be business information which came from General Electric, or some other company, and they have a legal right, or they have asserted a legal right to the confidentiality of those documents.

Under the law they would be entitled to the confidentiality of those documents. So in March of '05 we issued a protective order. We said these documents, Entergy must make these documents available to any party who signs an agreement and says I won't disclose them, I will use them for this proceeding, we can use them for this proceeding all we want, but I won't disclose them further than this proceeding.

The Protective Order, signed a non-disclosure agreement, you can have access to these documents. But it is only the parties that can have access to these documents, and only those that have signed a non-disclosure agreement.

And, of course, the Judges. We can see the documents, we have seen the documents, we have read them. So we know what is in there. And when we have some questions associated with those proprietary documents, and which rely upon those proprietary documents.

And we have to ask the witnesses some of those questions. So that cannot be a public session. At that point we will have to have a private session where only people who have signed a non-disclosure agreement can sit in the room.

And, in fact, Mr. Shadis has been unable, for whatever reasons, they have not signed the non-disclosure agreement, so we will have to proceed, as best as we can, and ask the questions that we need to ask, mostly of Entergy, and their witnesses, and some of the Staff 9:2619 dealing with proprietary.

So there will be a separate proprietary session, which we have, after we have the public review. This may be this afternoon, tomorrow, I'm not sure when we will get to that session.

Let's see, here. Before we start, a couple of things. There are two preliminary issues that have been raised, and we are going to get to that in a minute. But one of them is that the Staff filed a motion to supplement the record, and we want to deal with that.

And another is the State of Vermont has sent a letter, of September 6th, I think that all the parties have received. And we would want to deal with that. We are going to deal with those two things before we start.

But, before we go any further, my colleagues, any additions, or suggestions?

(No response.)

CHAIR KARLIN: Okay, great. Any other burning issues that the parties think they need to raise at this point?

MR. TURK: Your Honor, after you finish the preliminary matters that you are going to address I would like to mention one other preliminary matter.

CHAIR KARLIN: Could you mention it now?

MR. TURK: Errata testimony which I have distributed.

CHAIR KARLIN: That would be fine. Okay, let's talk about the preliminary matters. I think I would like to, first, ask the parties to respond to the letter from the State of Vermont.

Ms. Hoffman, who is an attorney for the State of Vermont is here. They were parties in this matter up until May or June. They sent a letter asking if they could sit in, as I understand it, observing the public session. Of course anybody can do that, and I'm glad they are here, but also be an observer in the proprietary or closed session.

May I hear from Entergy, what is your position on that, do you have any objections to that?

MR. TRAVIESO-DIAZ: Mr. Chairman, after consultation with counsel, they have represented that they will continue to abide and observe by the terms of the confidentiality agreement that they signed, in 2005, we have no objection to them attending the proprietary session.

CHAIR KARLIN: Great. Okay, thank you. Staff?

MR. HAMRICK: The Staff has no objection.

CHAIR KARLIN: Thank you. Okay, very good. Then the State will be allowed to observe in that session. Ms. Hoffman, if I may, just get clarification from you?

You simply want to sit in and observe, you have no other --

MS. HOFFMAN: That is correct, Your Honor. Thank you very much, to all the parties, for agreeing to that. We are just here to observe.

CHAIR KARLIN: Excellent. Well, I think the participation of an interested sovereign state is important, and valuable, and so I'm glad you are here, and I'm glad the parties didn't object, since that would be a desirable thing to have. So this is good.

Turning to the Motion to Supplement the Record, the Staff of NRC requested supplementation, they had two additional exhibits that they wanted to submit.

We have thought about that, the parties briefed that issue. We don't need any argument on that. We are going to deny that motion. In the last six months three times NEC has come in and sought to delay or supplement the record, and the Staff has denied that, and we have denied that supplementation, because we were concerned about delays and the cascading effect that might be caused if the supplementation would occur, then the other party gets to cross supplement, then the questions that are raised.

And it is not, simply, a matter of throwing a couple of additional exhibits in, at the last minute. So we think the same considerations apply here, and we are not going to be able to receive that.

Further we think that there is some question about the materiality of the two exhibits. As I understand it, from the motion by the Staff, these two documents, which talk about that the ODYN code is not only okay to use, but is required to use, those are 25 years old.

It appears that neither the Staff, or the Applicant, in three years of working on this matter, were even aware of that memo, those two memos, and they didn't take them into consideration in anything they did. And we don't think that it is really going to be material to this ruling, and no one relied on it, and so we will deny that.

With that, I think -- oh, the errata. Mr. Turk, did you want to talk about the errata materials?

MR. TURK: Yes, just very briefly, Your Honor. In the Licensing Board's order of August 24th you provided an opportunity for the parties to review their testimony and file any errata that they noticed had to be made any changes of the testimony.

I have placed before each member of the Licensing Board, the Licensing Board's clerk, and the other parties, three documents. One is an errata sheet. It is a brief one paragraph submission, along with the erratas shown in columnar format, insertions and deletions.

The second document is a redline strike --

CHAIR KARLIN: So that is this appendix A document?

MR. TURK: Yes.

CHAIR KARLIN: All right.

MR. TURK: The second document that I have placed before you is a redline strike-out version of the testimony with the errata inserted, so you can see exactly where the errata will be placed in the testimony that will be filed with the court reporter and placed in the record.

And then the third document is a clean copy of the testimony with the errata in place.

CHAIR KARLIN: I see.

MR. TURK: And that will be the document that we introduce into the record when we present our witnesses.

CHAIR KARLIN: Okay, good, thank you. That is fine. Here is what we will do. These errata just deal with, in fact, errors and misstatements, and misspeaking, as opposed to trying to substantively change any of the testimony.

They are self-explanatory. Exhibit numbers were inserted, if the number had previously been placed in the testimony and that exhibit number has changed we corrected it.

CHAIR KARLIN: Oh, I see.

MR. TURK: There are two additional types of changes which, again, is self-explanatory. The

Staff has used a draft guidance document in reviewing the application here. That draft document was section 14.2.1 of the standard review plan, NUREG 0800.

CHAIR KARLIN: That is an existing exhibit, or exhibit?

MR. TURK: That is an exhibit that will be in evidence. That is the draft, version draft of December 2002.

CHAIR KARLIN: Was that in the exhibits you previously submitted?

MR. TURK: Yes.

CHAIR KARLIN: Okay, it is not a new exhibit?

MR. TURK: That is not a new exhibit.

CHAIR KARLIN: Okay.

MR. TURK: And in the last week of August, just a few weeks ago, the NRC issued the final guidance document, which is NUREG 0800 section 14.2.1, dated August 2006.

We are not proposing to put that into the record although if Your Honors request it we can. We have extra copies of that. That is a revision to the draft guidance.

So we have noted, in our testimony, that the draft guidance document that is cited in our testimony, has since been revised. And we are doing that just as a matter of making the record complete, bringing it to your attention, putting that fact in the record.

CHAIR KARLIN: Okay, here is what we will do. I appreciate you letting us know this. When your time comes to introduce your exhibits and your testimony, later in the day or morning, if there are any objections to any particular part of the changes, they can be heard, we will hear them at that time.

And, you know, so I think it will give Mr. Shadis and, perhaps, us a chance to look at the redline version and see if there is anything there that is of concern, or problematic, or whatever. So we appreciate it.

We will rule on that when the time comes. Yes, Mr. Shadis?

MR. SHADIS: It seems to me that it is just another way of trying to introduce new documents after the opportunity has --

CHAIR KARLIN: Right. When they come to introduce those please raise your objection and tell us. I think it might be valid to look at the errata, and the corrections, and see what is in there.

I mean, if there is a problem, let's hear about it. If everything is innocuous then that is a different story. Just take a look at it and you can raise your objection then. Thank you.

With that I think we are ready to start with opening statements, starting with counsel for Entergy. Mr. Travieso-Diaz?

MR. TRAVIESO-DIAZ: Good morning, again. Before I start could I ask for a clarification, or make a request? The clarification is, is it correct that we will have ten minutes for the opening statement, and three additional minutes for rebuttal?

CHAIR KARLIN: Yes, sir.

MR. TRAVIESO-DIAZ: Second, the request is that given that Entergy has the burden of proof, we would like to provide our rebuttal at the end, after the rebuttal of the other parties, so we can hear what the rebuttal is like and respond to it.

CHAIR KARLIN: Well, is the NEC going to do its direct and then do its rebuttal right afterwards?

MR. TRAVIESO-DIAZ: They get 13 minutes then.

CHAIR KARLIN: No, let's just go down the line.

MR. TRAVIESO-DIAZ: All right. Mr.

Chairman --

CHAIR KARLIN: Let me just mention. As I say, these mikes do not amplify our sound in any way. They are just for the court reporter. So, especially because yours is facing this way, if you would try to speak up so the public can hear, that would be great.

MR. TRAVIESO-DIAZ: I will try to be loud, usually it is not a problem.

This hearing, today, constitutes the last step in a long three year process towards the implementation of an extended power uprate, or EPU, for the Vermont Yankee nuclear power plant.

In the intervening three years the NRC Staff has performed an exhaustive evaluation of the requested uprate. Entergy has provided 50 supplements to its uprate application to address questions and respond to issues raised by the Staff.

This proposed uprate has also been reviewed extensively by the Advisory Committee on Reactor Safeguards. In January of 2006 the Advisory Committee on Reactor Safeguards issued a letter to the Chairman of the NRC, in which they recommended that the uprate be approved.

In March of 2006 the NRC Staff issued a comprehensive, 350 page, safety evaluation for the proposed uprate and ultimately concluded that approval of the uprate was consistent with protecting public health and safety, and approved implementation of the uprate.

In fact the plant has now been operating safely under uprate conditions for six months. The process that we are going through today is in parallel to all of these examinations by the Staff and the ACRS, and it consists, as Chairman Karlin related, in looking into the one remaining contention that has been raised by one of the Intervenors that sought a hearing in this matter.

The contention that is before us deals with the performance of large transient testing for the Vermont Yankee plant under uprated conditions.

And, as defined by the Board, large transient testing in this context means two tests. The main steam isolation valve, or MSIV closure test, and the generator load rejection test. And those are the only two tests that are in controversy.

Performance of any other test, or performance of the plant under normal operating conditions is not part of the contention or of the hearing.

In its EPU application Vermont Yankee

sought an exception to the requirement that the standard review plan imposes on performing these two tests as part of the implementation of uprate.

Entergy provided very comprehensive and reasoned basis for that exception to be granted. The exception would have been consistent, also, with the fact that in more than a dozen uprates that have been approved, in this country, similar to the one at Vermont Yankee, in no situation, in no case, has there been a requirement that there be a performance of these tests.

The Safety Evaluation Report by the NRC Staff that was issued in March of 2006 concluded that for the reasons stated in Vermont Yankee's exception, in its application, that the tests did not need to be performed.

Likewise, in its letter to the NRC Chairman, the ACRS also concluded that it was not necessary to perform these tests.

So the Board is to have examined this issue, for Vermont Yankee, and generally had concluded that performance of these tests is not necessary.

Now, we have provided extensive discussion, on the record, the testimony provided by our witnesses, of what the reasons are why these exceptions should be granted and need not be performed.

Basically, and without going into great detail, which will transpire in the course of the hearing, the reason why these tests need to be performed is that the information that you would get, if you performed the tests, has very limited value and can be easily supplemented by a variety of ways which Vermont Yankee has tried to explain.

The ways in which the valve information that you would get, from performing the tests, would be obtained otherwise includes utilization of the analytical techniques that are available to predict how the plant would respond to one of these transients, should it occur.

Second, the performance of plants that have experienced this type of transient, while operating under uprated conditions. Third, the performance of Vermont Yankee, itself, when it experienced transits before the uprate, at the lower power levels.

Fourth the test experience, at least one plant that has performed the tests. In addition to all these data points as to what would the test show if performed there is additional evidence that the plant would be able to perform safely in the event of one of these transients.

The additional evidence is given by the component and system testing that is performed, as a matter of course, during the operation of the plant, and which involves the main systems and components that would be involved in responding to such a transient.

Second, the operational experience of Vermont Yankee in implementing the uprate, and the fact that there have been no material changes to the plant that would change the nature of the response to the uprate.

Third, the fact that this type of uprate is performed, or conducted, at a constant pressure and, therefore, the components that are required to perform their function, in the event of a transient, don't see any great difference in the inputs that they receive, whether they are operating at the prior power levels, or at the uprated levels.

For all those reasons we believe that the information that you will get from the performance of these tests is readily available. On the other side of the ledger, the value that you get from the tests is very limited because the way these tests are performed, the transient that results is very mild, is nowhere near the design basis transient against which the plant is designed.

It is, essentially, replicating what would happen if the event were to happen if the plant functioned normally. So you are not going to get any information that is not already available just by doing the tests.

And on the other side of the ledger, the down side of performing the test is two-fold. First you are introducing an additional thermal cycle on the plant and the primary systems, and that is something you want to avoid because you want to reserve the cycles in your system to cope with unexpected events. For example, a loss of the grid, in which you need to close down, not because of reasons having to do with the performance of your plant, but because of external events.

So the performance of a test that introduces a stress cycle, thermal cycle, is something that you would avoid if you didn't need to.

And second, quite frankly, there is a heavy availability penalty that results from performing these tests, because your plant has to shut down for two or three days. And, obviously, that is something that you like to avoid, in terms of providing service to your customers.

So for all those reasons I believe that the record will show that this plant doesn't need to perform this type of testing and, therefore, an exception was granted by the Staff, and that the Board should deny the contention and not require that this test be performed. Thank you.

CHAIR KARLIN: Thank you. Mr. Hamrick?

MR. HAMRICK: Thank you, Mr. Chairman. The Staff's function in this case is to review the license amendment application for Vermont Yankee's extended power uprate and whether that application meets the Commission's regulations.

As Chairman Karlin discussed, earlier, following the application the Staff issued a notice for opportunity for a hearing. Contentions were filed, requests for a hearing were submitted. Several contentions were admitted, but there is only one remaining before the Board today.

That is NEC contention 3, which requests that the amendment not be granted unless large transient testing is a requirement. As has already been discussed, by Board Order, these large transient tests are limited to the main steam line isolation valve closure, and generator load rejection tests.

In the meantime the Staff has been reviewing the application and has, in fact, completed its review. The Staff's determined that Entergy's application for the EPU meets the Commission's regulations.

This review was documented in the Staff's safety evaluation, which it issued on March 2nd of 2006. The Staff also determined that the amendment involved no significant hazards consideration and, therefore, issued the amendment that same day.

Also on March 2nd Sherwin Turk, counsel for the NRC Staff, sent a letter to the Licensing Board, and the parties in this proceeding, notifying the Board and the parties, that the amendment had, in fact, been issued, and provided a copy of the safety evaluation and the amendment itself.

As stated before, the issue involved in this proceeding is not the broad question of whether the EPU should be granted. Rather it is a more focused issue, a more narrow issue, of whether Entergy's test program for the Vermont Yankee EPU, which does not include large transient testing, is sufficient to assure that all testing required to demonstrate that structures, systems and components, will perform satisfactorily in service, as identified and performed.

This standard comes from appendix B of 10CFR Part 50, specifically criterion 11. In the Staff's safety evaluation it concluded that Entergy's test program does, in fact, meet the standard.

Today the Staff will be calling a panel of five witnesses for the purpose of adopting testimony that has previously been submitted in writing. The Staff's testimony will explain how it reached this decision in light of the application's request for an exception from large transient testing.

The Staff's panel consists of the following people, seated to my left, behind me. First Mr. Rick Ennis, a senior project manager for the NRC Staff, is the project manager for the Vermont Yankee power uprate.

Mr. Ennis coordinated the Staff's evaluation of the EPU application review and, also, coordinated the preparation of a safety evaluation.

Mr. Steven Jones is a senior reactor systems engineer. Mr. Jones supervised the Staff's EPU safety review for balance of plant POP systems.

Mr. Robert Pettis, Jr., a senior reactor engineer with the NRC Staff, coordinated the Staff's review of the power uprate testing program at issue in this contention.

Mr. George Thomas, a senior reactor systems engineer, conducted the reactor systems review of the testing analyses submitted by the Applicant. And, finally, MS. Zena Abdullahi, also a senior reactor systems engineer, conducted the review of the analytical methods used to perform the reactor neutronic and thermohydraulic analysis.

Also present, in the courtroom today, with NRC Staff, are Darryl Roberts, branch chief from the division of reactor licensing and Timothy Collins, a senior level advisor from the division of safety systems. These two men will not be witnesses but I just wanted to identify them as being in the courtroom.

You will hear, in the Staff's testimony, that it followed the standard review plan for the extended power uprate testing program. SRP14.2.1. And this document was created to assist the Staff in its determination of whether an EPU test program, including a test program that does not include large transient testing, meets the applicable standard.

That is demonstrating that these systems, structures, and components, will perform satisfactorily in service.

You will hear, in the Staff's testimony, that Entergy's EPU application follows General Electric's constant pressure power uprate, or CPPU approach.

The Staff's testimony will explain that this approach does not call for large transient testing and that the Staff has approved this method, but has not approved the generic exception for large transient testing.

This exception is to be examined on a plant specific basis. And to make that plant specific determination the Staff looks back at the factors in section 14.2.1, the standard review plan.

And these factors, as has been stated earlier, indicate things such as previous operating experience, introduction of new thermohydraulic phenomenon, and guidance contained in vendor topical reports, among other things.

In the Staff's testimony you will hear how the Applicant provided this information, the Staff reviewed it, and how the Staff found the test program includes all testing necessary to ensure that SSCs, or systems, structures and components, would perform satisfactorily in service.

In addition you will also hear about another factor, from 14.2.1, the transient analysis that were performed using the ODYN code. You will hear that the ODYN code has been approved by the NRC for use in performing transient analyses and based upon its comparison to actual transients at BWRs.

In conclusion the Staff's testimony will demonstrate that it approved Entergy's test program even without large transient testing because it has found that large transient testing is not required in this case to demonstrate that structures, systems and components, important to safety, will perform satisfactorily in service.

Thank you.

CHAIR KARLIN: Thank you, Mr. Hamrick. Mr. Shadis?

MR. SHADIS: The performance of large transient testing was first included in General Electric's format for the constant pressure power uprate in order to demonstrate that systems, structures, systems and components will perform as intended, and as required under NRC regulation.

Specifically we are looking at 10CFR Part 50, the Appendix B, Criterion 11, that sets the requirement for such demonstration. The major justification for not performing large transient testing is based on the belief, apparently, that the ODYN Code can conservatively and reliably predict plant behavior during a large transient at EPU conditions.

The validity of the Entergy position of not performing transient testing would depend on the documentation that supports the ability of the ODYN Code to duplicate a large transient test.

It is apparent, to us, that Entergy is grossly in error in interpreting the reports that document the benchmarking of the ODYN Code. Our expert, Dr. Hopenfeld, will be able to show you why Entergy misinterpreted the capabilities of the ODYN Code.

He will discuss that the benchmarking reports, given the opportunity, he will discuss what the benchmarking reports actually represent, and not what Entergy claims to meet.

The NRC practice is to allow the use of computer codes for licensing applications only if they are benchmarked against plant data and were applied accordingly.

The ODYN code was benchmarked by General Electric against the Peach Bottom turbine data, and was accepted by NRC as a best estimate code for predicting critical powers and pressures during large transients under certain operating conditions.

Entergy mistakenly claims that these conditions are also applicable to Vermont Yankee at EPU conditions. We will show you the actual plant operating conditions for which the use of ODYN was intended.

In addition to the comparison of ODYN to Peach Bottom data that Entergy stated that several other large transients have been compared, in proprietary documents against ODYN all indicating the applicability of ODYN to VY at EPU conditions.

Since we have no access to these reports we shall, in the opportunity provided, indicate to you what to look for in those reports, what questions the Panel might ask in the evaluation of those topical reports.

In addition to using the ODYN code Entergy cites general reactor experience with transients at BWR plants. And at VY the justification for not conducting tests.

We agree with Entergy that a comparison is important to operating conditions at other plants. However they have failed to compare the actual conditions, the actual parameters in existence at those other plants, and to plants throughout the country.

CHAIR KARLIN: Thank you, Mr. Shadis. Mr. Travieso-Diaz, three minutes, please. Any rebuttal?

MR. TRAVIESO-DIAZ: Thank you. Since Mr. Shadis indicated that the bulk of their testimony will be focusing on the use or, as they claim, misuse of the ODYN code, my rebuttal will be focusing on that, mainly.

If time allows I will talk to some other things. He made two statements of fact which are incorrect. First he claims that ODYN is a pacman era code and has not been upgraded. He ought to know better because in one of our exhibits, which shows how ODYN was used to predict the Vermont Yankee response to a transient under the current 2005 conditions in the last reload, the version of ODYN that was used was version nine. The version against which Peach Bottom was benchmarked was version two.

As our witnesses will show, ODYN has undergone significant refinements in the modeling techniques, not in the way the code operates itself, but in the modeling, has become more refined, and more precise, over the years. So this is not a pacman era code.

Second he alleges, generally, that ODYN cannot be used at Vermont Yankee because the conditions under which it was benchmarked, at Peach Bottom, in the late '70s, are different than the ones that exist at Vermont Yankee.

That is also erroneous, as a matter of fact, in that the conditions that were under which ODYN was benchmarked, represented bounding limiting conditions that don't exist in a plant, they are more severe.

They were used, precisely, to determine and establish the design basis of the plant which you expect that you will never reach, because you are artificially creating a far more severe transient than your plant will see.

Therefore the use of ODYN to predict the performance of a transient at a plant like Vermont Yankee, if anything, results in a more conservative result against actual conditions that you see in a transient, than otherwise.

He also claims that we have drawn, we meaning Entergy, has drawn comparisons with other plants that have experienced transients without taking into account the parameters that were of interest at those plants.

In fact in the direct testimony of Mr. Nichols and Mr. Casillas early on, there is a table that compares the parameters of interest for two plants, Vermont Yankee and the Brunswick Unit I, which is one of the plants that were involved in transients for which we take credit.

And the table clearly shows that the parameters of interest are virtually the same for both plants. I'm fine?

CHAIR KARLIN: Perfect timing.

MR. TRAVIESO-DIAZ: All right, I will stop here. I will have the clock be my --

CHAIR KARLIN: Mr. Hamrick?

MR. HAMRICK: Thank you, Mr. Chairman. I just have a few points to make. In NEC's opening Mr. Shadis implied that the Staff's decision seems to be based solely upon the ODYN analysis.

The Staff's decision is not based solely on the ODYN analysis. It is based upon many factors, factors I discussed earlier, from the standard review plan 14.2.1, including previous operating experience, industry wide operating experience.

Additionally the original ODYN code may very well be older than pacman. But as has been indicated, it is not necessarily relevant. As you will hear in the Staff's direct testimony, ODYN has been benchmarked more recently than pacman, and has been compared to more recent transient events.

The Staff's testimony will explain that it was updated following these transient tests in order to increase its fidelity to the transient events. Thank you.

CHAIR KARLIN: Mr. Shadis?

MR. SHADIS: Thank you. Both Entergy and NRC Staff predicate, under their assurance on the past performance of Vermont Yankee, in full transient conditions. That, of course, is the performance of Vermont Yankee at the original licensed thermal power.

And to take a small change, and to predict the performance on those events, it has limited value, but it does have value. And I think that the Board should consider it in its most rudimentary terms.

Vermont Yankee had transients that they cite, in the 1990s, and most recently we have full transients in 2004. And it is a matter of some debate as to whether or not the plant performed as expected in those transients, or whether or not damage was done that could be reflected in future transients.

However, what it does tell us is that

given the history of transients at Vermont Yankee we can expect transients in the future. We could be, in fact, oblivious to the news outside, we could be experiencing a full transient at Vermont Yankee even as we speak.

New England Coalition believes that the right conservative thing to do would be to test under controlled conditions, under conditions in which the components and systems are fully instrumented, in which the company is prepared to record data, and then derive assurance from that testing.

Or if the computer modeling were adequately constructed, and benchmarked, to give dependable full parameter results, then perhaps that route could be taken to obtaining an exemption from full transient testing.

However, we believe that the evidence has shown, and will continue to show, and will emerge in today's discussion, that those standards, those criteria, were exception to full transient testing have not been met.

The sum total of all that has been done in no way equals full transient testing. Thank you.

CHAIR KARLIN: Thank you. All right, and now having heard the opening statements and rebuttal, we will turn to the actual presentation, formal presentation of the evidence.

(Interruption from the audience.)

CHAIR KARLIN: This proceeding will hereby adjourn until order can be restored.

(Whereupon, the above-entitled matter went off the record at 10:10 a.m. and went back on the record at 10:23 a.m.)

CHAIR KARLIN: We will now turn to Entergy to present its exhibits and testimony, or at least its witnesses who we will then question.

I would suggest, it is going to take a minute or two, perhaps you would do the exhibits first if you would, Mr. Travieso-Diaz?

MR. TRAVIESO-DIAZ: In whichever order it pleases you. We could do that.

As you know we have 37 exhibits. So it is going to take a while to have them marked and distributed. But we can start right now.

CHAIR KARLIN: It is going to take a while, and we want to go through them. We need to do this right to make sure we have all the exhibits properly marked, identified, and admitted, if they get admitted.

MR. TRAVIESO-DIAZ: Mr. Chairman, in the

interest of time I propose to move for their admission at the end, when I have them all marked, as opposed to do them one by one.

CHAIR KARLIN: Yes, that is right. And if we could all try to speak up, again? This is not a PA system, this is just for the court reporter. I can hear, I think up here we can hear, very clearly, what is going on. But if members of the public, recognizing they are here, it might even help, at some point, to stand up. But let's see if we can do this sitting down. Please proceed.

MR. TRAVIESO-DIAZ: I will start by marking for identification --

CHAIR KARLIN: And if you would bring those over to our law clerk, Ms. Carpentier?

MR. TRAVIESO-DIAZ: I'm providing three copies, original and two copies. of what has been identified as Entergy exhibit 1. For the record, that exhibit is the resume of Craig Joseph Nichols.

(Whereupon, the above-referenced to document was marked as Entergy Exhibit No. 1 for identification.)

CHAIR KARLIN: Very good. You have it premarked, as we established in our order?

MR. TRAVIESO-DIAZ: I believe so. Entergy exhibit 2 is the resume of Jose L. Casillas.

(Whereupon, the above-referenced to document was marked as Entergy Exhibit No. 2 for identification.)

MR. TRAVIESO-DIAZ: Entergy exhibit 3 consists of table 1 through 3 of revision 18A to the Brunswick updated FSAR, and tables 1.7.1; 1.7.2; 1.7.3; 1.7.4; 1.7.5; and 1.7.6 of the Vermont Yankee updated FSAR, revision 17.

CHAIR KARLIN: I have that marked for identification as exhibit 3.

MR. TRAVIESO-DIAZ: As exhibit 3.

(Whereupon, the above-referenced to document was marked as Entergy Exhibit No. 3 for identification.)

MR. TRAVIESO-DIAZ: Entergy exhibit 4 is section 14.2.1 entitled Generic Guidelines for Extended Power Uprate Testing Programs. And it is of NUREG 0800, the Staff Standard Review Plan, draft rev 0, December of 2002.

(Whereupon, the above-referenced to document was marked as Entergy Exhibit No. 4 for identification.)

MR. TRAVIESO-DIAZ: Entergy exhibit 5 is attachment 7 to Entergy letter to the NRC, BVY03-80, that is 80, Vermont Yankee Nuclear Power Station Proposed Technical Specification, Change Number 263, Extended Power Uprate. And the Attachment is entitled Justification for Exception to Large Transient testing.

CHAIR KARLIN: That is number 5 for identification.

(Whereupon, the above-referenced to document was marked as Entergy Exhibit No. 5 for identification.)

MR. TRAVIESO-DIAZ: Entergy exhibit 6 is attachment to the Entergy letter to the NRC, BVY03-98. It is Vermont Yankee Nuclear Power Station Proposed Technical Specification Change Number 263, Supplement Number 3, Extended Power Uprate, and the document is entitled Updated Information Justification for Exception to Large Transient Testing.

(Whereupon, the above-referenced to document was marked as Entergy Exhibit No. 6 for identification.)

MR. TRAVIESO-DIAZ: Entergy exhibit 7 --

CHAIR KARLIN: Let me just check for a minute. Ms. Carpentier, are you okay with the numbering? All right, please continue.

MR. TRAVIESO-DIAZ: Entergy exhibit 7 is an excerpt from the Final Safety Evaluation Report for Vermont Yankee Nuclear Power Station, Extended Power Uprate, by the NRC Staff, and the excerpt consists of pages 267 to 271.

(Whereupon, the above-referenced to document was marked as Entergy Exhibit No. 7 for identification.)

MR. TRAVIESO-DIAZ: Entergy exhibit 8 is a report entitled Global Nuclear Fuel Supplemental Reload Licensing Report for Vermont Yankee Nuclear Power Station, Reload 24, Cycle 25, with Extended Power Uprate. And the report number is 0000-0035-6443-SRLR Rev. 0, December 2005, pages 8 to 10 and 13.

(Whereupon, the above-referenced to document was marked as Entergy Exhibit No. 8 for identification.)

MR. TRAVIESO-DIAZ: Entergy exhibit 9 is a Licensee Event Report for the Edwin I. Hatch Nuclear Power Plant, Unit II, and the LER Number is 1999-005-00, and the title is Generator Ground Fault Causes Turbine Trip and Reactor Scram. And the date is May 27, 1999.

(Whereupon, the above-referenced to document was marked as Entergy Exhibit No. 9 for identification.)

MR. TRAVIESO-DIAZ: Entergy exhibit 10 is a Licensee Event Report for the Edwin I. Hatch Nuclear Power Plant, Unit II. The LER number is 50-366/2001-003. And the title of the LER is Sudden Closure of Main Steam Isolation Valve Causes Pressure Increase and Reactor Scram of APRM High Flux. And the date is February 14, 2002.

(Whereupon, the above-referenced to document was marked as Entergy Exhibit No. 10 for identification.)

MR. TRAVIESO-DIAZ: Entergy exhibit 11 is a Licensee Event Report for the Edwin I. Hatch Nuclear Power Plant, Unit I. The LER number is 50-321/2000-004, and the title is Component Failure Causes Turbine Trip and Reactor Scram. And the date is August 4, 2000.

(Whereupon, the above-referenced to document was marked as Entergy Exhibit No. 11 for identification.)

MR. TRAVIESO-DIAZ: Entergy exhibit 12 is a Licensee Event Report for the Edwin I. Hatch Nuclear Power Plant, Unit I, the LER number is 50-321/2001-0021, Component Failure Causes Turbine Trip and REactor Scram. And the date is May 21, 2001.

(Whereupon, the above-referenced to document was marked as Entergy Exhibit No. 12 for identification.)

CHAIR KARLIN: Entergy exhibit 13 is Licensee Event Report for the Brunswick Steam Electric Plant, Unit 2. The LER number is 2-03-004. The title is Loss of Generator Excitation Results in Reactor Protection System and Other Specified System actuations. And the date is January 5, 2004.

(Whereupon, the above-referenced to document was marked as Entergy Exhibit No. 13 for identification.)

MR. TRAVIESO-DIAZ: Entergy exhibit 14 is Licensee Event Report for the Dresden Nuclear Power Station, Unit 3. The LER number is 2004-001-00, and the title is Unit 3 Automatic Scram During Testing for the Main Turbine Master Trip Solenoid Valves, March 24, 2004 is the date.

(Whereupon, the above-referenced to document was marked as Entergy Exhibit No. 14 for identification.)

MR. TRAVIESO-DIAZ: Entergy exhibit 15 is Licensee Event Report for the Dresden Nuclear Power Station Units 2 and 3. The LER number is 2004-002-00, the title is Unit 3 Automatic Scram due to Main Turbine Low Pressure Trip, and Subsequent Discovery of Inoperability of the Units 2 and 3 High Pressure Coolant Injection Systems. And the date is March 30, 2004.

(Whereupon, the above-referenced to document was marked as Entergy Exhibit No. 15 for identification.)

MR. TRAVIESO-DIAZ: Entergy exhibit 16 is Licensee Event Report for the Dresden Nuclear Power Station Units 2 and 3. The LER number is 2004-003-00, the title is Unit 3 Scram Due to Loss of Offsite Power and Subsequent Inoperability of the Standby Gas Treatment System for Units 2 and 3, and the date is July 6th, 2004.

(Whereupon, the above-referenced to document was marked as Entergy Exhibit No. 16 for identification.)

MR. TRAVIESO-DIAZ: Entergy exhibit 17 is Licensee Event Report Vermont Yankee Nuclear Power Station, LER number 91-05, the title is Reactor Scram Due to Mechanical Failure of the 345KV Switchyard Bus Caused by Broken High Voltage insulator stack. The date is April 12th, 1991.

(Whereupon, the above-referenced to document was marked as Entergy Exhibit No. 17 for identification.)

MR. TRAVIESO-DIAZ: Entergy exhibit 18 is Licensee Event Report for the Vermont Yankee Nuclear Power Station, LER number 91-09, Reactor Scram Due to Loss of Normal Offsite Power (LNP) Caused by Inadequate Procedure Guideline. And the date is June 6, 1991.

(Whereupon, the above-referenced to document was marked as Entergy Exhibit No. 18 for identification.)

MR. TRAVIESO-DIAZ: Entergy exhibit 19 is a Licensee Event Report for the Vermont Yankee Nuclear Power Station, LER number 91-14, the title is Reactor Scram Due to Loss of 345KV Switchyard Caused by Defective OFfsite Carrier Equipment. The date is July 11, 1991.

(Whereupon, the above-referenced to document was marked as Entergy Exhibit No. 19 for identification.)

MR. TRAVIESO-DIAZ: Entergy exhibit 20 is a Licensee Event Report, Vermont Yankee Nuclear Power Station, LER number 2004-003-01, the title is Automatic Reactor Scram Due to a Main Generator Trip as a Result of the ISO-Phase Bus Duct Two-Phase

Electrical Fault. The date is June 14th, 2005.

(Whereupon, the above-referenced to document was marked as Entergy Exhibit No. 20 for identification.)

MR. TRAVIESO-DIAZ: Entergy exhibit 21 is a Licensee Event Report for the Vermont Yankee Nuclear Power Station, the LER is number 2005-001-00, Reactor Trip Caused by an Electrical Insulator Failure in the 345KV Switchyard Due to a Manufacturing Defect. And the date is September 22, 2005.

(Whereupon, the above-referenced to document was marked as Entergy Exhibit No. 21 for identification.)

MR. TRAVIESO-DIAZ: Entergy exhibit number 22 is a letter from Graham Wallis --

CHAIR KARLIN: Hold on.

MR. TRAVIESO-DIAZ: I'm sorry? I didn't read 22. 22 is the letter from Graham Wallis, the Chair of the ACRS, to Chairman Nils J. Diaz, of the NRC. And the subject is Vermont Yankee Extended Power Uprate, the date is January 4, 2006.

(Whereupon, the above-referenced to document was marked as Entergy Exhibit No. 22 for identification.)

MR. TRAVIESO-DIAZ: Entergy exhibit 23 --

CHAIR KARLIN: Wait a second.

MR. TRAVIESO-DIAZ: I'm sorry?

CHAIR KARLIN: Do we have everything? Check it out.

(Pause.)

CHAIR KARLIN: I might say, for the public, at this point we already, the members of the Board and the other lawyers, and representatives, already have copies of these documents in our hands.

These are being entered in a formal way, for the record, so that we can have this formally introduced as evidence. That is the process we are going through right now.

Please proceed.

MR. TRAVIESO-DIAZ: May I proceed?

CHAIR KARLIN: Starting with 23.

MR. TRAVIESO-DIAZ: Entergy exhibit 23 is exhibit 1 to the Rebuttal Testimony of Craig J. Nichols, and Jose L. Casillas on NEC Contention 3, Large Transient Testing. The date is June 14, 2006.

And the title is Summary of ODYN Model Reports. And ODYN is spelled O-D-Y-N.

(Whereupon, the above-referenced to document was marked as Entergy Exhibit No. 23 for identification.)

MR. TRAVIESO-DIAZ: Entergy exhibit 24 is exhibit 2 to the rebuttal testimony of Craig J. Nichols and Jose L. Casillas, on NEC Contention 3, Large Transient Testing. The date is June 14, 2006, and the title is Summary of ODYN Studies Reports.

(Whereupon, the above-referenced to document was marked as Entergy Exhibit No. 24 for identification.)

CHAIR KARLIN: Are you on 24 at this point?

MR. TRAVIESO-DIAZ: I am about to go on to 25.

CHAIR KARLIN: All right. Let me ask you, on 23, and 24, the testimony of the two witnesses has, attached to it, in response I think, or reference to answer 56, a table attached to the testimony, table 1.

Is that exhibit 23?

MR. TRAVIESO-DIAZ: No, exhibit 23 is a

document that was prepared by the witnesses to summarize some of the ODYN reports.

CHAIR KARLIN: Right.

MR. TRAVIESO-DIAZ: And it was introduced as exhibit to the testimony at the time that the testimony was filed. There were two exhibits, and those exhibits are now 23 and 24.

CHAIR KARLIN: All right.

MR. TRAVIESO-DIAZ: Entergy exhibit 25 is a General Electric Company Licensing Topical Report, Constant Pressure Power Uprate Report number NEDO-33004P-A, Revision 4, dated July 2003, and this is a non-proprietary version.

(Whereupon, the above-referenced to document was marked as Entergy Exhibit No. 25 for identification.)

MR. TRAVIESO-DIAZ: Entergy exhibit 26 is General Electric Company Topical Report entitled Qualification of the One Dimensional Core Transient Model for Boiling Water Reactors. The report number is NEDO-24154-A, volume 1. And the date is August of 1986.

(Whereupon, the above-referenced to document was marked as Entergy Exhibit No. 26 for identification.)

MR. TRAVIESO-DIAZ: Entergy exhibit 27 is a General Electric Company Topical Report, Qualification of the One-Dimensional Core Transient Model for Boiling Water Reactors, report number NEDO-24154-A, Volume II, and it is dated August of 1986.

(Whereupon, the above-referenced to document was marked as Entergy Exhibit No. 27 for identification.)

MR. TRAVIESO-DIAZ: Entergy exhibit 28 is a Global Nuclear Fuel document, entitled Supplement Reload Licensing Report for Vermont Yankee Nuclear Power Station, Reload 24, Cycle 25, with Extended Power Uprate. Report number 0000-0035-8443-SRLR, Rev 0 --

CHAIR KARLIN: Did you say 6443?

MR. TRAVIESO-DIAZ: Yes, 6443-SRLR, Rev 0, and the date is December of 2005.

(Whereupon, the above-referenced to document was marked as Entergy Exhibit No.

28 for identification.)

MR. TRAVIESO-DIAZ: The remaining exhibits are proprietary, and I request that they be treated separately and they be given the protection of proprietary documents.

CHAIR KARLIN: They will be treated separately and handled separately. I think in terms of the numbering, we would like to have the numbering add a P at the end. So I believe this one will be Entergy 29-P, we will call it 29-P.

MR. TRAVIESO-DIAZ: Correct. Entergy exhibit 29-P is a proprietary document entitled General Electric Nuclear Energy Report GE-0000-0037-98547-02, Rev 2, Supplemental Data-Supplemental Reload Licensing Report for Vermont Yankee Nuclear Power Station, Cycle 25 (with Extended Power Uprate), and the date is October 2005.

(Whereupon, the above-referenced to document was marked as Entergy Exhibit No. 29P for identification.)

CHAIR KARLIN: Just hold for a moment. Ms. Carpentier, this is the number 29P? Do you have that? All right, good, I just wanted to make sure you caught the point here. Okay. So he just introduced

29P. Now we are at?

MR. TRAVIESO-DIAZ: Entergy exhibit 30 is a proprietary document.

CHAIR KARLIN: It is 30P.

MR. TRAVIESO-DIAZ: Yes, I'm sorry, 30P is a General Electric Company Licensing Topical Report, Constant Pressure Power Uprate, the report number is NEDC-33004-A, Rev 4, and the date is July 2003.

(Whereupon, the above-referenced to document was marked as Entergy Exhibit No. 30P for identification.)

MR. TRAVIESO-DIAZ: Entergy exhibit 31P is a proprietary document, and the title is, well, General Electric Licensing Topical Report, number NEDE-24154-P-A, Qualification of the One-Dimensional Core Transient Model to Licensing Basis Transients, and the date is August of 1986.

(Whereupon, the above-referenced to document was marked as Entergy Exhibit No. 31P for identification.)

CHAIR KARLIN: Could you repeat the name of that document?

MR. TRAVIESO-DIAZ: Yes.

CHAIR KARLIN: The Qualification of the --

MR. TRAVIESO-DIAZ: Qualification of the One-Dimensional Core Transient Model for Boiling Water Reactors, Volume 3, Application of One-Dimensional Transient to Licensing Basis Transients.

CHAIR KARLIN: All right, thank you.

MR. TRAVIESO-DIAZ: Entergy exhibit 32P, Proprietary General Electric Company report number NEDC-24154P-A, entitled Qualification of the One-Dimensional core Transient Model (ODYN) for Boiling Water Reactors, and Supplement 1, Volume 4. It is dated February 2000.

(Whereupon, the above-referenced to document was marked as Entergy Exhibit No. 32P for identification.)

MR. TRAVIESO-DIAZ: Entergy exhibit 33P is a proprietary General Electric Document, GE Nuclear Energy Report number GE-NE-0000-0041-1254-RO, ODYN Benchmark of the Dresden 3, January 20, 2004, Turbine Trip Event. And it is dated July 2005.

(Whereupon, the above-referenced to document was marked as Entergy Exhibit No. 33P for identification.)

MR. TRAVIESO-DIAZ: Entergy exhibit 34P is a proprietary document, a General Electric Company report number NEDE-30253, the title is Qualification of the ODYN M05, and ODYNV05 Computer Programs. And the date is September 1983.

(Whereupon, the above-referenced to document was marked as Entergy Exhibit No. 34P for identification.)

MR. TRAVIESO-DIAZ: Entergy exhibit 35P is a proprietary document entitled General Electric report number GENE-A13-00413-01-04, entitled Engineering Evaluation of the KKL Revision 99 Turbine Trip Test, 109% Power (3420MWT) 11 September 1999. And the date of the report is December 1999.

(Whereupon, the above-referenced to document was marked as Entergy Exhibit No. 35P for identification.)

MR. TRAVIESO-DIAZ: Entergy exhibit 36P is a proprietary document entitled GE Nuclear Energy Report No. B33-00296-02P, entitled, Recirculation Flow Control Valve Maximum Pump Up-Shift Position for LaSalle County Nuclear Station, Units 1 and 2, and it is dated March 1998.

(Whereupon, the above-referenced to document was marked as Entergy Exhibit No. 36P for identification.)

MR. TRAVIESO-DIAZ: And, finally, Entergy exhibit 37P is a proprietary document entitled GE Nuclear Energy Report No. GE-NE-B3100264-01, Duane Arnold Energy Center Recirculation Runback Setpoint Evaluation, and it is dated April 1998.

(Whereupon, the above-referenced to document was marked as Entergy Exhibit No. 37P for identification.)

MR. TRAVIESO-DIAZ: And I would like to move, at this point, for these exhibits to be admitted into evidence.

CHAIR KARLIN: Any objections?

(No response.)

CHAIR KARLIN: Hearing none they will be admitted into evidence in this proceeding.

(The documents referred to, having been previously marked for identification as Entergy Exhibit Numbers 1-28 and 29P-37P were admitted in evidence.)

CHAIR KARLIN: Now if you would, Mr. Travieso-Diaz, your witnesses will -- we will examine your witnesses.

MR. TRAVIESO-DIAZ: I would like to --

CHAIR KARLIN: Wait a minute. Very good, Judge Baratta reminded me. We have a question regarding the testimony that may entail two additional exhibits.

In the testimony, as we understand it, of Mr. Nichols and Mr. Casillas, I'm not sure if I pronounced that correctly, on page 6 and 7 as we have it, answer his question 16, and there is some reference to the Brunswick and Vermont Yankee plants showing similarities. Attached as exhibit 3 there is a discussion.

And on the next page, page 7, there is this chart. Do you see what I'm referring to?

MR. TRAVIESO-DIAZ: Yes. And, in fact, what the intent here is that the table that is on page 7, which is part of the testimony, was prepared by comparing those portions of the SARS from Brunswick and Vermont Yankee.

Those portions are, in fact, separately entered as exhibits. I believe that they are in exhibit 3. So the table that is on page 7 reflects the information that is contained on Entergy exhibit 3.

CHAIR KARLIN: Is it the identical document?

MR. TRAVIESO-DIAZ: Well, what the witnesses did was take the relevant parameters that are reflected in those tables and transcribing in their testimony.

CHAIR KARLIN: Well, I think it is a different document. If I'm looking at Entergy exhibit 3, as I have it here, it is entitled -- well, tell me what the title of exhibit 3 is.

MR. TRAVIESO-DIAZ: The title of exhibit 3 is CP&L (Brunswick) Updated FSAr, Revision 18A.

CHAIR KARLIN: Okay. That is not what appears on page 7.

MR. TRAVIESO-DIAZ: Well, again, as I was saying --

CHAIR KARLIN: Therefore I think either we will have to strike that, or you need to introduce it as a separate exhibit, this chart on page 7.

MR. TRAVIESO-DIAZ: The intent on this --

CHAIR KARLIN: I understand what the intent is but --

MR. TRAVIESO-DIAZ: Yes --

CHAIR KARLIN: -- it cannot be brought in as testimony. We don't have Mr. Nichols, or Mr. Casillas saying I testify that the steam line link at Brunswick is 391. We just have a chart that sort of sits in the middle of their testimony.

So it has to be an exhibit or we will drop it out entirely.

MR. TRAVIESO-DIAZ: Well, we could make it exhibit 38, but --

CHAIR KARLIN: Yes, I think that is what we need to do. And also we have, as I'm confused a little bit, answer to 56, I believe that is on page 25, question and answer 56, Mr. Nichols refers to table 1 attached, provides a listing of this, that, and the other.

And then there is this table 1 attached, which is entitled Table 1 Vermont Yankee Equipment Modifications Implemented for EPU. Is that a separate exhibit somewhere?

MR. TRAVIESO-DIAZ: I don't believe it needs to be an exhibit because Mr. Nichols will testify that he prepared that table. So he can testify as to the contents of the table and the accuracy of what is contained there.

CHAIR KARLIN: Well, if you want it in

evidence, for us to consider it, you need to have it as an exhibit, or we will just strike it out. Because his testimony is in, that is all he has got. You can put that in as an exhibit or not.

MR. TRAVIESO-DIAZ: Well --

CHAIR KARLIN: I think it --

MR. TRAVIESO-DIAZ: Well, I would be happy to make it exhibit 39.

CHAIR KARLIN: Right. I think that is what we need to do, is add these two as exhibits. Now, the reason why, this is not additional testimony that is a surprise to anyone. It was filed back in May and everyone had a chance and a shot at it.

So we are not adding supplementary or last minute type of stuff. It is just a procedural thing. I think Ms. Carpentier has copies of it. If you don't have copies of those documents, which you can then now proffer as exhibits whatever, 38 --

MR. TRAVIESO-DIAZ: I offer those two documents as exhibits 38 and 39. And I will be happy to make separate copies of those available for the court reporter and for Ms. Carpentier, at the convenient point.

CHAIR KARLIN: I think that would be good. Therefore, just for everyone's clarification, the chart that appears at page 7 of the Nichols and Casillas testimony will be Entergy exhibit 38. It is not proprietary, obviously.

(Whereupon, the above-referenced to document was marked as Entergy Exhibit No. 38 for identification.)

CHAIR KARLIN: And the table 1 that appears at the end of that testimony in response, I believe, to question and answer 56, will appear as Entergy exhibit 39.

(Whereupon, the above-referenced to document was marked as Entergy Exhibit No. 39 for identification.)

MR. TRAVIESO-DIAZ: And I would move, at this point, that they be admitted into evidence.

CHAIR KARLIN: All right, fine. Any objections?

(No response.)

CHAIR KARLIN: Question, Mr. Shadis?

MR. SHADIS: We have no objections.

CHAIR KARLIN: All right, fine. Then those two will be entered as exhibits in that order. Do you have that Ms. Carpentier? Okay, great.

(The documents referred to, having been previously marked for identification as Entergy Exhibit Nos. 38 and 39 were admitted in evidence.)

CHAIR KARLIN: All right, thank you Judge Baratta for reminding me of that. We wanted to get that clear.

MR. TRAVIESO-DIAZ: I would like to call, at this point, to testify Mr. Craig J. Nichols and Mr. Jose L. Casillas.

CHAIR KARLIN: Very good. Please take the stand, if you would. Sit over here in the jury box.

Whereupon,

CRAIG J. NICHOLS

JOSE L. CASILLAS

were called as witnesses by Counsel for Entergy and, having been duly sworn, assumed the witness stand, were examined and testified as follows:

MR. TRAVIESO-DIAZ: Mr. Nichols, would you state your full name for the record, please?

WITNESS NICHOLS: My name is Craig Joseph Nichols.

MR. TRAVIESO-DIAZ: Mr. Casillas, would you state your full name for the record, please?

WITNESS CASILLAS: Yes. My name is Jose Luis Casillas.

MR. TRAVIESO-DIAZ: Mr. Nichols and Mr. Casillas do you both have, in front of you, a document bearing the caption of this proceeding, dated May 17, 2006, and entitled Testimony of Craig J. Nichols and Jose L. Casillas, on NEC Contention 3, Large Transient Testing?

WITNESS NICHOLS: I do.

WITNESS CASILLAS: I do.

MR. TRAVIESO-DIAZ: Gentlemen, did you prepare this testimony, or was it prepared under your own direct supervision and control?

WITNESS CASILLAS: Yes.

WITNESS NICHOLS: Yes.

MR. TRAVIESO-DIAZ: Do you have any corrections to make to this testimony?

WITNESS NICHOLS: I do not.

WITNESS CASILLAS: No.

MR. TRAVIESO-DIAZ: This testimony is true and correct to the best of your knowledge and belief?

WITNESS CASILLAS: Yes.

WITNESS NICHOLS: Yes.

MR. TRAVIESO-DIAZ: Do you adopt it as your direct sworn testimony in this proceeding?

WITNESS CASILLAS: Yes.

WITNESS NICHOLS: Yes.

MR. TRAVIESO-DIAZ: I would ask, then, that the direct testimony of Craig Nichols and Jose Luis Casillas be inserted into the record, at this point, as if read?

CHAIR KARLIN: Any objections?

(No response.)

CHAIR KARLIN: The testimony will be admitted and bound into the transcript as if having been read.

(Whereupon, the direct testimony of Jose Casillas and Craig Nichols was bound into the record as if having been read.)

May 17, 2006

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

Before the Atomic Safety and Licensing Board

In the Matter of	)	
	)	Docket No. 50-271
ENTERGY NUCLEAR VERMONT YANKEE, LLC and ENTERGY NUCLEAR OPERATIONS, INC.	)	ASLBP No. 04-832-02-OLA (Operating License Amendment)
(Vermont Yankee Nuclear Power Station)	)	

TESTIMONY OF CRAIG J. NICHOLS AND JOSE L. CASILLAS ON NEC CONTENTION 3 – LARGE TRANSIENT TESTING

May 17, 2006

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

Before the Atomic Safety and Licensing Board

In the Matter of ENTERGY NUCLEAR VERMONT YANKEE, LLC and ENTERGY NUCLEAR OPERATIONS, INC. (Vermont Yankee Nuclear Power Station)	)	Docket No. 50-271 ASLBP No. 04-832-02-OLA (Operating License Amendment)

TESTIMONY OF CRAIG J. NICHOLS AND JOSE L. CASILLAS ON NEC CONTENTION 3 – LARGE TRANSIENT TESTING

I. WITNESS BACKGROUND

Craig J. Nichols ("CJN")

Q1. Please state your full name.

A1. (CJN) My name is Craig J. Nichols.

Q2. By whom are you employed and what is your position?

A2. (CJN) I am the Extended Power Uprate Project Manager for Entergy Nuclear Operations, Inc. ("Entergy"). In that capacity, I am the manager for the implementation of the extended power uprate ("EPU") at the Vermont Yankee Nuclear Power Station ("VY").

Q3. Please summarize your educational and professional qualifications.

A3. (CJN) My professional and educational experience is summarized in the *curriculum vitae* attached to this testimony as Exhibit 1. Briefly summarized, I have over twenty years of professional experience working in various technical and managerial capacities at

VY. For the last four years, I have managed all activities relating to the implementation of the EPU at VY. I received a B.S. Degree in Electrical Engineering from Northeastern University.

Q4. What is the purpose of your testimony?

A4. (CJN) The purpose of my testimony is to address, on behalf of Entergy Nuclear Vermont Yankee, LLC and Entergy Nuclear Operations, Inc. (collectively "Entergy"), Contention 3 submitted by the New England Coalition ("NEC") in this proceeding. As admitted by the Atomic Safety and Licensing Board ("Board"), NEC Contention 3 reads:

> The license amendment should not be approved unless Large Transient Testing is a condition of the Extended Power Uprate.

Memorandum and Order, LBP-04-28, 60 NRC 548, 580, App. 1 (Nov. 22, 2004).

In addition, the scope of NEC Contention 3 has been clarified recently by the Board, which has ruled that "the 'Large Transient Testing' at issue in NEC Contention 3, and the testimony and other evidence to be submitted concerning it, are limited to the main steam isolation valve closure test and the turbine generator load rejection test." Memorandum and Order (Clarifying the Scope of NEC Contention 3) (April 17, 2006), slip op. at 3.

Q5. What has been your role in the VY EPU project as it relates to NEC Contention 3?

A5. (CJN) In my capacity as manager for the VY EPU project, I have been responsible for overseeing the plant modifications needed to implement the upgrade and the performance of the technical evaluations and analyses required to demonstrate VY's ability to operate safely under uprate conditions. I am familiar with VY's operating history, current plant operations, and the anticipated operating conditions after the uprate.

Jose L. Casillas ("JLC")

Q6. Please state your full name.

A6. (JLC) My name is Jose L. Casillas.

Q7. By whom are you employed and what is your position?

A7. (JLC) I am the Plant Performance Consulting Engineer in the Nuclear Analysis group of the Engineering organization of General Electric ("GE") Nuclear Energy. In that capacity, I am responsible for boiling water reactor ("BWR") plant performance design and analyses, including evaluations in support of EPU applications and the development and application of computer codes used to predict BWR plant performance.

Q8. Please summarize your educational and professional qualifications.

A8. (JLC) My professional and educational experience is summarized in the *curriculum vitae* attached to this testimony as Exhibit 2. Briefly summarized, I have over thirty-two years of direct technical experience working in all aspects of plant performance at GE Nuclear Energy, including transient analysis. I received a B.S. Degree in Mechanical Engineering from the University of California, Davis.

Q9. What is the purpose of your testimony?

A9. (JLC) The purpose of my testimony is to address those aspects of NEC Contention 3 that relate to the industry experience regarding the response of BWRs to large transients.

II. OVERVIEW

A. Issues Raised By Contention

Q10. What is your understanding of the technical issues raised by NEC Contention 3?

A10. (CJN) In its license amendment application ("EPU Application") to increase the authorized power level of VY from 1593 megawatts thermal ("MWt") to 1912 MWt, Entergy sought, in accordance with the guidance in Standard Review Plan ("SRP") 14.2.1, to be excused from performing Large Transient Testing ("LTT"). NEC Contention 3 asserts that LTT must be conducted to assure that the public health and safety is protected during EPU operations, and that the EPU should not be approved unless LTT is required to be performed.

Q11. Do you agree with the assertion in NEC Contention 3 that the EPU Application should not be approved unless LTT is a condition to the approval of the license amendment?

A11. (CJN, JLC) No.

Q12. What is the basis for your disagreement?

A12. (CJN, JLC) The effects of large transients at EPU conditions can be predicted analytically, on a plant-specific basis, without the need for actual transient testing. This conclusion is supported by: (a) the similarity of the pre-EPU and post-EPU VY design configuration and system functions; (b) results of past transient testing at VY and other BWRs and the plants' responses to unplanned transients; (c) confirmation that the transient safety analysis results bound the experience from actual transients; and (d) the experience with unplanned transients at other post-EPU plants.

The transient analyses performed for the VY EPU demonstrate that all safety criteria are met under uprate operating conditions. On the other hand, a reactor SCRAM from EPU power levels –

such as would occur during LTT – would provide no meaningful new information and would cause an undesirable transient cycle on the station's systems.

III. DISCUSSION

A. EPU General Description

Q13. Please describe the analytical bases for the VY EPU Application.

A13. (CJN) The VY EPU request was prepared following the guidelines contained in the NRC-approved document "General Electric Company Licensing Topical Report (CLTR) for Constant Pressure Power Uprate Safety Analysis: NEDC-33004P-A Rev. 4, July 2003" ("NEDC-33004P-A"). Implementation of the guidance in NEDC-33004P-A results in an increase in reactor power without an increase in reactor operating pressure (i.e., a "constant pressure power uprate" or "CPPU").

Q14. Why is a CPPU advantageous?

A14. (JLC) The CPPU methodology, which maintains the same reactor operating pressure as originally licensed, greatly simplifies the engineering analyses and equipment and procedural changes required to achieve uprated conditions. It also assures that the plant's performance during transients will be analogous to that before the uprate.

Q15. Have any other plants uprated their thermal power using the CPPU approach?

A15. (JLC) Yes. Thirteen BWRs similar to VY have implemented EPUs without increasing reactor operating pressure:

- Hatch Units 1 and 2 (1998) (105% to 113% of Original Licensed Thermal Power ("OLTP")) (The Hatch units previously had 5% "stretch" uprates, from 100% to 105% OLTP)
- Monticello (1998) (106% OLTP)

- Muehleberg (i.e., KKM) (1993) (105% to 116% OLTP)
- Leibstadt (i.e., KKL) (2000) (104% to 119.7% OLTP)
- Duane Arnold (2001) (104.1% to 119.4% OLTP) (The Duane Arnold unit previously had a 4.1% "stretch" uprate, from 100% to 104.1% OLTP)
- Dresden Units 2 and 3 (2001) (100% to 117% OLTP)
- Quad Cities Units 1 and 2 (2001) (100% to 117.8% OLTP)
- Clinton (2002) (100% to 120% OLTP)
- Brunswick Units 1 and 2 (2002) (105% to 120% OLTP) (The Brunswick units previously had 5% "stretch" uprates, from 100% to 105% OLTP).

None of the domestic BWR plants similar to VY that have implemented EPUs without increasing reactor operating pressure has been required to perform LTT at EPU power levels.

Q16. How similar are these plants to VY?

A16. (JLC) They are similar to VY in all significant respects that bear on large transient performance. For example, the Brunswick units are both BWR/4 plants with Mark 1 containments, like VY. Comparison of the designs of important parameters for the Brunswick and VY plants shows their striking similarities in areas such as power density, steam relief and bypass capacities that would affect the large transient performance of the plants. This information has been extracted from UFSAR Tables 1.7.1 through 1.7.4 of the VY and Brunswick plants (attached as Exhibit 3) and supports the prediction that the performance of both plants in the event of a large transient would be substantially the same.

Parameter	VY	Brunswick	Comment
Power Density, MW/assembly	5.2	5.2	Equivalent
Number of Fuel Assemblies	368	560	VY has 34% less fuel and correspondingly lower steam flow than Brunswick.
Steam Line Length, ft.	331	391	VY has 15% smaller length, though the stem flow is correspondingly less than Brunswick.
Safety and Relief Capacity, % of Steam	60	56	Equivalent
Bypass capacity, % of Steam	86	69	VY has 25% greater capacity resulting in milder pressure rise following a turbine/generator trip.
Turbine Valve Closure Time, sec.	</= 0.1	</= 0.1	Equivalent
Main Steam Valve Closure Time, sec.	</= 5.0	</= 5.0	Equivalent
SCRAM Insertion Time, sec.	</= 3.5	</= 3.5	Equivalent

B. Large Transient Testing

Q17. Which are the tests that are classified as LTTs?

A17. (JLC) NEDC-33004P-A defines two LTTs applicable to EPU operations: the Main Steam Isolation Valve ("MSIV") Closure and the Generator Load Rejection tests. These tests, when conducted during plant operation, are similar to counterpart tests performed during initial plant startup testing. The NRC Staff has accepted these two LTTs as verifying that plant performance after EPU will be as predicted. See Exhibit 4, SRP 14.2.1, "Generic Guidelines for Extended Power Uprate Testing Programs" (Draft, 2002) ("SRP 14.2.1"), Section III.C.2.f.

Q18. Does NRC guidance call for the performance of LTT at plants undergoing an EPU?

A18. (JLC) NRC's Review Standard RS-001, "Review Standard for Extended Power Uprates," Revision 0 (December 2003) refers to SRP 14.2.1 for the testing related to extended power uprates. The SRP specifies that LTT is to be performed in a similar manner to the testing that was performed during initial startup testing of the plant. SRP 14.2.1, Section III.A.1.

Q19. Does the SRP make provisions for licensees to take exception to the performance of the LTT?

A19. (CJN) Yes. The SRP provides guidance on how to justify a request for elimination of the LTT requirement. Id., Section III.C.2. Entergy has followed the SRP guidance in taking exception to performing the large transient tests (i.e., MSIV closure and generator load rejection tests) during EPU operations at VY.

Q20. Please describe the MSIV closure transient.

A20. (CJN) Sudden closure of all MSIVs at power is an "Abnormal Operational Transient" as described in Chapter 14 of the VY Updated Final Safety Analysis Report ("UFSAR"). The MSIV closure test requires the fast closure (within 3.0 to 5.0 seconds) of all eight MSIVs from full rated power.

Q21. What is the purpose of the MSIV closure test?

A21. (CJN) The MSIV closure test is intended to (1) demonstrate that reactor transient behavior during and following simultaneous full closure of all MSIVs is as expected; (2) check the MSIVs for proper operation; and (3) determine or confirm MSIV closure time at full power.

Q22. What limiting aspect of plant operations is challenged during a Main Steam Isolation Valve closure transient?

A22. (CJN) The transient produced by an MSIV closure ("with Flux SCRAM") is the most severe abnormal operational transient from the standpoint of increase in nuclear system pressure. However, for the full licensing basis transient to take place it is necessary that the direct SCRAM signals from the valve position switches that would cause a reactor trip do not occur and that the SCRAM be delayed until the high flux signal is received. For that reason, an MSIV closure test performed as part of LTT would not result in an appreciable transient because the SCRAM signals would issue from the MSIV position switches and cause a SCRAM. The prompt SCRAM would significantly reduce the pressure transient that would otherwise occur.

Q23. Please describe a generator load rejection transient.

A23. (CJN) A Generator Load Rejection From High Power Without Bypass ("GLRWB") (commonly referred to as a "turbine generator load rejection" or a "generator load rejection") is an Abnormal Operational Transient as described in Chapter 14 of the UFSAR. The GLRWB transient is initiated by a rapid closure of the turbine control valves after a load rejection. For the full licensing basis transient to take place, however, it is necessary that all bypass valves fail to open. (The bypass valves open following a control valve closure to provide a path for steam to the condenser for plant cooldown and to maintain reactor pressure control.)

Q24. What aspect of plant operations is challenged in a GLRWB transient?

A24. (CJN) A GLRWB provides a bounding challenge to the fuel thermal limits, assuming none of the bypass valves open.

Q25. What is the purpose of a generator load rejection test?

A25. (CJN) The purpose of this test is to determine and demonstrate reactor response to a generator trip, with particular attention to the rates of change and peak values of power level, reactor steam pressure and turbine speed. In reality, however, a generator load rejection test performed as part of LTT would result in bypass valve opening and would in effect be the same as any plant trip at full power and thus provide no comparable information to that resulting from an actual GLRWB transient.

Q26. How did Entergy document its request for an exception to the LTT provisions in SRP 14.2.1?

A26. (CJN) Entergy included with its EPU Application as Attachment 7, "Justification for Exception to Large Transient Testing," Exhibit 5 hereto. Entergy subsequently supplemented its justification for the requested exception by submitting additional information. EPU Application, Supplement 3, Att. 2 (Oct. 28, 2003), attached as Exhibit 6. In those submittals, Entergy addressed the factors outlined in SRP 14.2.1 as justifying not performing the LTT, including: (1) VY's general response to unplanned transients; (2) analyses of specific transients; (3) the impact of EPU modifications; and (4) relevant industry experience. Entergy addressed the justification for not performing LTT in subsequent licensing submittals, including EPU Application Supplements 19 (October 2004) and 32 (September 2005).

Q27. Why did VY take exception to performing these LTTs for its EPU?

A27. (CJN) If performed, the MSIV closure and generator load rejection tests would not confirm any new or significant aspect of performance that is not routinely demonstrated by component level testing and demonstrated through analyses. It is important to note that the EPU transient analyses for VY were performed assuming operational configurations and component/system failures that are impractical to replicate during a testing program and are unlikely to be seen during actual plant operations, and therefore bound (i.e., represent more severe conditions than) the transients that would occur during actual plant operations or during LTTs.

Q28. Has Entergy's request for an exception from LTT been approved by the NRC Staff?

A28. Yes. In its Final Safety Evaluation Report for the VY EPU, the NRC Staff agreed that the exception from LTT requested by Entergy should be granted. SER at 267-270, attached as Exhibit 7. The Staff reached the following conclusion:

> Based on its review of the information provided by the licensee, as described above, the NRC staff concludes that in justifying test eliminations or deviations, other than the condensate and feedwater system testing discussed in SE Section 2.5.4.4, the licensee adequately addressed factors which included previous industry operating experience at recently uprated BWRs, plant response to actual turbine and generator trip tests at other plants, and experience gained from actual plant transients experienced in 1991 at the VYNPS. From the EPU experience referenced by the licensee, it can be concluded that large transients, either planned or unplanned, have not provided any significant new information about

transient modeling or actual plant response. As such, the staff concludes that there is reasonable assurance that the VYNPS SSCs will perform satisfactorily in service under EPU conditions. The staff also noted that the licensee followed the NRC staff approved GE topical report guidance which was developed for the VYNPS licensing application.

Q29. Can the behavior of the VY plant during a large transient be bounded analytically?

A29. (CJN) Yes. The large transient analyses for VY, which were performed using the NRC-approved code ODYN, predict the behavior of the safety- and non-safety-related systems in the plant during operational transients. These large transient analyses model both the performance of the secondary side of the plant and any relevant potential interactions between primary and secondary systems in a transient to evaluate the parameters of interest.

Q30. Please provide a summary description of the ODYN code.

A30. (JLC) ODYN is a proprietary code developed by GE and approved by the NRC in 1981 for use in the analysis of GE BWR plant response to pressurization transients. A description of the ODYN model and the qualification as well as the USNRC Safety Evaluation Report can be found in NEDO 24154-A (proprietary) dated August 1986. The ODYN model has been upgraded over the last 20 years to include greater modeling detail such as increased nodes, advanced physics correlations, and more representative control systems. These changes have consistently improved the accuracy of the ODYN code and reduced the uncertainty in its predictions compared against the qualification tests. Recently, the ODYN model has been approved by the NRC for application to all GE BWR plant transients.

Q31. How does the ODYN code model the behavior of BWRs such as VY during large transients?

A31. (JLC) The ODYN code models BWR vessel physical components, mechanical equipment functions, control systems and nuclear/thermal-hydraulic phenomena. The simulation involves describing the physical plant in the model (i.e., volumes, flow paths, resistances), establishing the desired operating conditions (i.e., water level, power, pressure) and introducing a disturbance (i.e., valve closure, pump trip, control action). The ODYN model predicts the plant response behavior based on its physical model correlations.

The ODYN analyses assume operational configurations and component/system failures that bound (i.e., represent more severe conditions than) the transients that would occur during normal plant operations or design basis events, including large transients.

Q32. What is your understanding of the term "design codes"?

A32. (JLC) Design codes are the computer simulation models applied in analyses to ensure that the structures, systems and components in a nuclear power plant discharge their intended function during normal, transient and accident conditions. As such, design codes incorporate appropriate margins of conservatism.

Q33. What is your understanding of the term "best estimate codes"?

A33. (JLC) Best estimate codes are computer simulation models applied in analyses intended to accurately predict the actual behavior of a nuclear power plant (or portions thereof) during normal operations, transients, or design basis accidents.

Q34. Which of the two terms, "design code" or "best estimate code", more accurately describes the operation of the ODYN code?

A34. (JLC) The ODYN code is accepted as a best estimate code, though it includes some conservative biases due to simplified aspects of the model. GE has qualified the ODYN code against all significant plant transients and the NRC has accepted that the ODYN code is a dependable best estimate code.

Q35. What is the impact of the nature of the ODYN code on the ability to obtain realistic predictions of plant behavior during the two large transients that are the subject of this contention?

A35. (JLC) As a best estimate code benchmarked against all significant transients, ODYN is capable of predicting accurately the plant behavior during transients occurring at higher EPU power levels.

Q36. Has the ODYN code been assessed against actual MSIV closure transients or load rejection transients at an operating facility?

A36. (JLC) Yes, the ODYN code has been benchmarked against all significant plant transients including turbine trips (equivalent in its effects to a generator load rejection test) and main steam valve isolation events. The turbine trip data were obtained from the Peach Bottom and KKM plants; the MSIV closure data were obtained from the Hatch plant.

The qualification of ODYN against the plant pressurization transients involved modeling each plant description and simulation of the transient. The ODYN code-predicted parameters are compared against the measured data, and the results of the comparison are used to determine the application basis of the ODYN results to licensing analyses.

Q37. Do the results of these benchmark assessments demonstrate the ability of the code to accurately predict plant performance during large transients?

A37. (JLC) Yes. The Peach Bottom turbine trip tests date back to the late 1970s and form the initial benchmark for pressurization transients and uncertainty margins for the ODYN code. All subsequent advanced versions of the ODYN code have been assessed against these tests and continue to form the basis for the code's accuracy. The current version of the ODYN code continues to accurately predict the overpower magnitude and slightly overpredict the overpressure magnitude vis-à-vis the Peach Bottom tests. The ODYN model was later also qualified against MSIV transient data and determined to also predict the peak pressure results conservatively, consistent with its approved application basis.

Q38. What other assessments have been made of the performance of the ODYN code and its ability to predict the behavior of BWRs such as Vermont Yankee during large plant transients?

A38. (JLC) The ODYN model was initially developed exclusively for the prediction of, and benchmarked against, fast pressure transients such as MSIV closure, turbine trips or GLRWBs. However, since that time, GE has expanded its qualification and application to include all other significant transients, such as recirculation flow and coolant temperature disturbances. The code has been determined to accurately predict plant behavior in those transients.

Q39. Do the large transient analyses compute the stresses that are imparted on mechanical components during the transients under uprate conditions?

A39. (JLC) The best estimate ODYN model is applied using bounding equipment performance and limiting initial conditions to predict the plant behavior. The resulting predicted parameters – principally pressure histories – are used to confirm that the reactor components and vessel meet the loads used in their design. With respect to large transients, the parameter of interest is the peak vessel pressure, whose design value is 1375 psig. The overpressure transient analysis is performed to confirm that the predicted peak pressure remains below this design value. No other loads on the vessel or its components are derived from the overpressure transient analyses. Therefore, stresses on components are not direct outputs of the ODYN simulations.

Q40. Have transient analyses been performed for MSIV closure and generator load rejection transients at VY occurring under EPU operation that bound the plant's behavior during those transients?

A40. (CJN) Yes. In advance of implementation of the EPU, GE prepared in December 2005 an updated Supplemental Reload Licensing Report ("SRLP") containing analyses of the performance of VY under EPU conditions. The SRLP contained, among others analyses, the results of licensing basis GLRWB and MSIV closure simulations conducted using the ODYN code. Copies of the pages of the SRLP that summarize the results of these simulations are included as Exhibit 8. The results of these simulations verified that: (1) these transients remain the limiting transients from the perspective of the selected parameters, and (2) the results remain within the design and license limits. Based on the benchmark results, the peak pressures calculated by ODYN would be overpredicted (conservatively high). These analyses still show significant margin to the limits. This type of analysis is performed as part of the core design for each operating cycle.

Q41. Why is it reasonable to conclude that the ODYN simulations of VY's behavior in large transients during EPU operation accurately predicts the actual plant response to those transients?

A41. (JLC) The ODYN model is qualified for the analysis of this type of transient and the resulting parameters are within the applicable physical correlations of the model for the bounding licensing analysis. Also, a VY LTT at the increased power condition at constant pressure would be significantly milder than the ODYN analyses. Several plant transients have been compared against ODYN predictions over the years to assess the specific BWR licensing basis. All of these comparisons have determined that the licensing predictions are bounding and that the plant equipment response is consistent with its design basis. Furthermore, GE has simulated in detail some of the transients for the purpose of revising the equipment response or setpoints in order to improve the plant response. None of these simulations has shown any ODYN model deficiency with respect to its licensing and qualification basis. Therefore, GE does not expect any model qualification benefit from the VY tests.

C. Technical Bases for Not Performing LTT at VY under EPU Operation

Q42. Besides the results of the ODYN analyses that you just described, is there a technical justification for excusing VY from performing LTT under EPU operations?

A42. (CJN, JLC) Yes. There are several sound technical bases that support Entergy's request for an exception from performing LTT at VY under uprate operations.

Q43. What are these bases?

A43. (CJN, JLC) They include: (1) the behavior of other plants that have experienced large transients during EPU operations; (2) the results of LTT conducted at an European plant similar to VY; (3) VY's responses to unplanned transients; (4) the regime of periodic component and system testing at VY; and (5) the similarity in VY's pre- and post- EPU design configuration and system functions. From these technical bases, it is reasonable and justifiable to conclude that the effects at EPU conditions can be analytically determined on a plant-specific basis without the need for actual transient testing. The transient analyses performed for the VY EPU demonstrate that all safety criteria are met and the uprate does not cause any previously non-limiting transient to become limiting.

D. Industry Experience Confirming the Transient Analysis Methodology

Q44. What industry experience confirms the basic transient analysis methodology used by Entergy at VY?

A44. (JLC) Of the thirteen BWR plants that have implemented EPUs without increased reactor operating pressure, four (Hatch 1 and 2, Brunswick 2, and Dresden 3) have experienced one or more unplanned large transients from uprated power levels. Specifically:

- Southern Nuclear Operating Company's ("SNOC") application for EPU of Hatch Units 1 and 2 was granted without a requirement to perform large transient testing. VY and Hatch are both BWR/4 plants with Mark I containments. Hatch Unit 2 experienced a post-EPU unplanned transient that resulted in a generator load rejection from approximately 111% OLTP (98% of uprated power) in May 1999. As noted in SNOC's LER 1999-005-00 (attached as Exhibit 9), all systems functioned as expected and no anomalies were seen in the plant's response to this transient.

- Hatch 2 also experienced a post-EPU reactor trip on high reactor pressure as a result of MSIV closure (from 113% OLTP (100% of uprated power)) in 2001. As noted in SNOC's LER 2001-003-00 (attached as Exhibit 10), all systems functioned as expected and designed, given the conditions experienced during the transient.

- In addition, Hatch Unit 1 has experienced two post-EPU turbine trips from 112.6% and 113% of OLTP (99.7% and 100% of uprated power) as reported in SNOC LERs 2000-004-00 and 2001-002-00, respectively (copies attached as Exhibits 11 and 12). Again, the behavior of the primary safety systems was as expected. No new plant behaviors for either plant were observed. The Hatch operating experience shows that the analytical models being used (which are the same as those in use at VY) are capable of modeling plant behavior at EPU conditions.

- As discussed earlier, Progress Energy's Brunswick Units 1 and 2 – which are very similar in design to VY – were licensed to uprate their power output to 120% of OLTP. Brunswick Unit 2 experienced a post-EPU unplanned transient that resulted in a generator/turbine trip due to loss of generator excitation from 115.2% OLTP (96% of uprated thermal power) in the fall of 2003. As noted in Progress Energy's LER 2003-004-00 (attached as Exhibit 13), no anomalies were experienced in the plant's response to this transient, and no unanticipated plant behavior was observed. The Brunswick operational experience shows that the analytical models being used (which are the same as those used at VY) are capable of modeling primary and secondary plant behavior at EPU conditions.

- Exelon Generating Company LLC's applications for EPU for Quad Cities Units 1 and 2, and Dresden Units 2 and 3 were granted without requiring the performance of LTT. The Quad Cities and Dresden units are plants similar to VY, featuring Mark I containments. Dresden 3 has experienced several turbine trips and a generator load rejection from high uprated power conditions. In January 2004, Dresden 3 experienced two turbine trips from 112.3% and 113.5% of OLTP (96% and 97% of uprated power) as reported in Exelon LERs 2004-001-00 and 2004-002-00, respectively (attached as Exhibits 14 and 15). The plant response was as predicted in the transient analyses, which used the same methodology as those performed at VY. The plant response indicates that the analytical models used for transient analyses are capable of accurately predicting transient plant behavior at EPU conditions.

- Similar plant response was observed in May 2004, when Dresden 3 also experienced a loss of offsite power which resulted in a turbine trip on Generator Load Rejection from 117% of OLTP (100% of uprated power). See Exelon LER 2004-003-00 (attached as Exhibit 16).

The fact that the Hatch, Brunswick, and Dresden plants, all of which are similar in design to VY, experienced no anomalous response to large transients from EPU operating levels supports the conclusion that VY should also respond as predicted to large transients during EPU operation.

Q45. Was the ODYN code used to provide the bounding transient analyses for all of these plants?

A45. (JLC) Yes. In every instance in which unplanned large transients from EPU power levels have been experienced at these plants and an analysis of the scenario involved in the transients existed, the plant's response was bounded by the analyses performed using ODYN and no new phenomena were exhibited in the response.

E. Industry experience with Large Transient Testing

Q46. Has LTT been performed on any plant after an EPU, and if so what were the test results?

A46. (JLC) Yes. The KKL (Leibstadt) power uprate implementation program was performed during the period from 1995 to 2000. Power was raised in steps from its previous operating power level of 104.2% OLTP to 119.7% OLTP. KKL testing for major transients involved turbine trips at 113.4% OLTP and 116.7% OLTP, and a generator load rejection test at 104.2% OLTP.

The response of the KKL reactor and other plant equipment during those large transient tests was satisfactory and was bounded by the ODYN code predictions for that plant.

Q47. How did the response of the KKL plant to a turbine trip transient compare to the analytical predictions made by the ODYN code?

A47. (JLC) A comparison of the KKL turbine test transient performance against the ODYN predictions shows consistency between the test results and those predicted in the model's qualification, as well as in other comparisons between ODYN runs and plant operating data. In all cases, the ODYN model slightly overpredicts vessel peak pressure. The KKL turbine trip test is an excellent prediction of what a test at VY would show because KKL has a 2% higher power density than VY and both plants are of a full turbine bypass capacity design.

Q48. NEC alleges (December 22, 2005 Answer to Entergy's Statement of Material Facts Regarding NEC Contention 3, para. 20) that since KKL is a foreign reactor not subject to NRC regulation, the KKL test results are irrelevant to the VY EPU, and that even if relevant, there is no ready means of reconciling regulatory data to those applicable to VY. Are these allegations valid?

A48. (JLC) No. Plant test performance is a physically observable phenomenon, which can be objectively measured and is independent of the regulatory regime. Furthermore, the same ODYN analytical model as used for VY was applied to simulate this test.

F. VY Operating Experience

Q49. Has VY experienced large transients during its operating lifetime?

A49. (CJN) Yes. VY has previously experienced the following unplanned large transients:

- On 3/13/1991, with the reactor at full power, a reactor SCRAM occurred as a result of Turbine/Generator Trip on Generator

Load Rejection due to a 345 kV Switchyard Tie Line Differential Fault. This transient was reported to the NRC in LER 1991-005-00, dated 4/12/91 (attached as Exhibit 17).

- On 4/23/1991, with the reactor at full power, a reactor SCRAM occurred as a result of a turbine/generator trip on generator load rejection due to the receipt of a 345 kV breaker failure signal. The transient included a loss of offsite power. This was reported to the NRC in LER 1991-009-00, dated 05/23/91 (attached as Exhibit 18).

- On 6/15/1991, during normal operation with reactor at full power, a reactor SCRAM occurred due to a Turbine Control Valve Fast Closure on Generator Load Rejection resulting from a loss of the 345 kV North Switchyard bus. This transient was reported to the NRC in LER 1991-014-00, dated 7/15/91 (attached as Exhibit 19).

- On 6/18/2004, during normal operation with the reactor at full power, a two phase electrical fault-to-ground caused the main generator protective relaying to isolate the main generator from the grid and resulted in a Generator Load Rejection reactor SCRAM. This transient was reported to the NRC in LER 2004-003-00, dated 8/16/2004 (attached as Exhibit 20).

- On 7/25/2005, during normal operation with the reactor at full power, a generator load rejection SCRAM occurred due to an electrical transient in the 345 kV Switchyard. This transient was reported to the NRC in LER 2005-001-00 (attached as Exhibit 21).

Q50. Did VY perform as expected in response to these transients?

A50. (CJN) Yes. No significant anomalies were seen in the plant's response to these transients. The performance of VY in the transients it experienced at pre-EPU power levels was well within the bounds of the ODYN analyses.

Q51. Does VY's historical response to large transients provide a basis for an exception to LTT?

A51. (CJN) Yes. In particular, the transients in 2004 and 2005 occurred after most of the modifications associated with EPU were already implemented, including the new HP turbine rotor, Main Generator Stator rewind, the new high pressure feedwater heaters, condenser tube staking, an upgraded isophase bus duct cooling system, and condensate demineralizer filtered bypass. In each instance, the modified or added equipment functioned normally during the transient. The plant's performance during these recent transients, including that of the modified components, demonstrates that the EPU modifications do not significantly affect the plant's response during transient conditions.

G. System and component testing

Q52. Does system and component testing during normal operations provide a basis for an exception to LTT?

A52. (CJN) Yes. Technical Specification-required surveillance testing (e.g., component testing, trip logic system testing, simulated actuation testing) is routinely performed during plant operations. Such testing demonstrates that the structures, systems and components ("SSCs") required for appropriate transient performance will perform their functions, including integrated performance for transient mitigation as assumed in the transient analysis.

Q53. How often are the main components involved in large transients tested?

A53. (CJN) The MSIVs are tested quarterly. The safety relief valves and spring safety valves are tested once every operating cycle. These valves are required to perform in accordance with the design during large transients; their periodic testing assures that their performance during large transients will be acceptable. Likewise, the reactor protection system instrumentation that is relied on to mitigate large transients is tested quarterly, assuring that it will carry out its design function in the event of a large transient.

Q54. What is the significance of the system and component testing program?

A54. (CJN) Because the characteristics and functions of SSCs are tested periodically during plant operations, they do not need to be demonstrated further in a large transient test. In addition, limiting transient analyses (i.e., those that affect core operating and safety limits) are re-performed for each operating cycle and are included as part of the reload licensing analysis.

II. Similarities in pre- and post-EPU plant design and physical configuration

Q55. Are there similarities in design and system function between the pre- and the post-EPU VY plant configuration?

A55. (CJN) There are great similarities. While some operating parameters (e.g., core power distribution) have been modified to accommodate EPU operation and some setpoint changes were made, these changes do not measurably contribute to response to large transients. None of the modifications that have been made will introduce new thermal-hydraulic phenomena as a result of power uprate, nor are any new system interactions during or as the result of analyzed transients introduced. No systems have been added or changed at VY that are required to mitigate the consequences of the large transients that would be the subject of the LTT.

Operationally, the EPU modifications have no significant effect on plant transient analysis because, since the uprate is a constant pressure uprate, most of the plant's systems will operate in the same manner as before the uprate. Also, the VY EPU is performed without a change in operating reactor dome pressure from current plant operation.

Q56. *Have there been major equipment modifications or new hardware installations at VY that could result in different large transient performance than that predicted by the analyses and the plant's prior operating history?*

A56. (CJN) No. Table 1 (attached) provides: (a) a listing of EPU plant modifications, all of which were implemented during VY's last two Refueling Outages (RFO 24 and RFO 25, in Spring 2004 and Fall 2005, respectively); (b) a determination of whether the modifications have an effect on the plant transient analysis; (c) a determination of whether the modifications are modeled in the transient analyses; (d) an indication of completed post modification testing; (e) an indication of subsequent power ascension and/or power operation confirmatory testing and monitoring; and (f) a determination of whether the modified function would be tested/verified during large transient testing.

Most of the EPU modifications were made to non-safety-related components, which are not credited in licensing basis transient analyses. Incidental modifications associated with EPU, such as alarms, indications, and scaling changes, also do not impact transient response.

Q57. How does the number of modifications and new equipment installations included in the VY EPU provide a basis for an exception to LTT?

A57. (CJN) Not only are the equipment modifications and additions relatively few but none of these modifications will introduce any new thermal-hydraulic phenomena as a result of the power uprate.

Nor are any new system interactions during or as the result of analyzed transients introduced.

I. **Impact of LTT on plant systems and components**

Q58. Would performance of LTT have an adverse impact on the plant?

A58. (CJN, JLC) The performance of a SCRAM from high power, such as those that take place during LTT, results in an undesirable transient cycle on the primary system. The occurrence of primary system transient cycles should be minimized, since they introduce unnecessary stresses on the primary system components. The undesirable effects of performing the tests outweigh the benefits of any limited additional information that may be gained from them.

In addition, performance of each LTT causes a plant shutdown. Any plant shutdown results in a generation outage for a period of time (typically 2-3 days) for the plant. Since there are no measurable safety benefits to be derived from the performance of the tests, the loss of generation revenue and other costs associated with the performance of the tests cannot be economically justified.

J. **Endorsement of LTT exception by ACRS**

Q59. Has the Advisory Committee on Reactor Safeguards examined the LTT exception sought by Entergy for the VY EPU?

A59. (CJN)Yes. In its letter to the NRC Chairman following its review of the VY EPU, the Advisory Committee on Reactor Safeguards concluded:

> 3. Load rejection and main steam isolation valve closure transient tests are not warranted. The planned transient testing program adequately addresses the performance of the modified systems.

Letter from Graham B. Wallis to NRC Chairman Nils Diaz dated January 4, 2006, attached as Exhibit 22.

IV. SUMMARY AND CONCLUSIONS

Q60. Please summarize your testimony.

A60. (CJN, JLC) Our testimony can be summarized as follows:

- **Previous industry operating and LTT experience**

Operating experience at other plants that have implemented a constant pressure power uprate such as that implemented by Entergy at VY has shown that the transient analysis results bound the performance observed during actual operational transients. This industry operating experience is applicable to VY because of the similarity in its design to that of those plants. The results of LTT at one plant similar to VY also confirm the validity of the analytical predictions of VY's response to LTT under EPU operating conditions.

- **Previous VY operating experience**

Previous operating experience at VY for large transients has shown that the plant has performed as expected, and that its performance during transients is bounded by the transient analyses of record for the facility. This operating experience includes transients in 2004 and 2005, which occurred after the completion of many of the plant modifications being implemented in preparation for the EPU. The plant's performance during the 2004 and 2005 transients demonstrates that the EPU modifications do not significantly affect the plant's response during transient conditions.

- **Absence of new thermal-hydraulic phenomena or system interactions**

The operation of VY after the EPU will result in different operating parameters (e.g., feedwater flow, moisture carryover) but will not result in any new thermal-hydraulic phenomena in the event of a plant transient. The modifications already implemented have no significant effect on plant transient analysis because, since the uprate is a constant pressure uprate, most of the plant's systems will operate in the same manner as before the uprate.

- ***No net benefits from LTT***

The benefits from conducting LTT would be minimal and would be outweighed by the potential adverse impact of LTT on the plant's systems and components.

- **Significant costs associated with performance of LTT**

Performance of LTT causes a plant shutdown. Any plant shutdown results in a generation outage for a period of time (typically 2-3 days) for the plant. Since there are no measurable safety benefits to be derived from the performance of the tests, the loss of generation revenue and other costs associated with the performance of the tests cannot be justified.

Q61. What are your conclusions regarding the assertions in NEC Contention 3?

A61. (CJN, JLC) We conclude that there is no support for the claims made in NEC Contention 3. The extensive and conservative engineering analyses, historical test and actual transient data, individual component testing, and observed performance at other plants experiencing large transients provide reasonable assurance and confidence that VY systems will function as designed in mitigation of large transients from EPU conditions. The potential benefits, if any, from LTT at VY are significantly outweighed by the adverse effect on plant systems and components from the tests themselves. VY's request for an exception to LTT, therefore, is reasonable and poses no threat to public health and safety.

Q62. Does that conclude your testimony?

A62. (CJN, JLC) Yes, it does.

Table 1: VY Equipment Modifications Implemented for EPU

Modification	Description	Potential Impact on Transient Response?	Post Mod Testing	EPU Startup Testing	Further Tested by Load Reject Without Bypass / Main Steam Isolation Valve Closure
Main turbine – LP diaphragm replacement	Replace 8th stage diaphragm of LP turbine	No	Vibration baseline measurements	Vibration monitoring	NA
Main turbine cross-around relief valves (CARVs) and Discharge Piping	Install higher capacity relief valves	No	In-service Leak check	Monitor temperature downstream of CARVs	No
Main generator -rewind	Rewind/upgrade main generator for CPPU conditions. Replace generator hydrogen coolers with upgraded coolers	No	• Performance test • AC Hi-Pot test each phase • Pressure and vacuum testing • Winding resistance • Meggering	• Monitor generator and cooling	• No
Main condenser	• Stake main condenser tubing to reduce the effects of flow induced vibration	No	• Leak check tubes • Monitor chemistry	• Monitor chemistry	• No
Feedwater heater 4A/B shell side relief valve	• Replace relief valves with larger capacity relief valve to accommodate increased feedwater flow	No	• Bench test valves • Leak test installation	NA	• No
Steam dryer cover plate strengthening	• Replace lower cover plates with thicker plates • Add reinforcing stiffeners at lower cover plates and vertical hood sides • Remove internal brackets in top inside corners of outer hoods • Replace vertical hood and hood top plates with thicker plates • Replace/Upgrade tie bars	No	• Inspection	• Vibration and moisture carryover monitoring during power ascension per power ascension test plan (PATP)	• No
Isolated phase bus duct cooling	• Install a new isolated phase bus duct cooling system to remove bus duct heat under CPPU conditions	No	• Monitor bus duct cooling • Flow tests	• Performance monitoring	• No

Modification	Description	Potential Impact on Transient Response?	Post Mod Testing	EPU Startup Testing	Further Tested by Load Reject Without Bypass / Main Steam Isolation Valve Closure
HP feedwater heater replacement	• #1A, #1B, #2A, and #2B feedwater heater replacement	No	• Pressure test • Visual inspection • Magnetic particle testing • Radiography • In-service inspection • Thermal performance demonstration	• Performance monitoring	• No
Residual heat removal service water (RHRSW) system	• Modify RHRSW pumps (Train A and B) Motor Bearing Oil Coolers piping to recover Service Water flow from the coolers	No	• Visual Inspection • Particle Testing • Ultrasonic Flow Testing • In-Service Inspection	NA	• No
NSSS/torus attached piping	• Upgrade particular NSSS and torus attached piping supports	No	• Welds to be examined by visual, liquid penetrant, magnetic particle, as applicable	NA	• No
Flow induced vibration (FIV)	• Install FIV instrumentation	No	• Verify installation	• Collect EPU data and analyze	• No
Reactor recirculation (RR) system runback	• Provide rapid runback of RR pump from high power on trip of condensate or feedwater pump	No	• Channel Calibration • Test with breakers in "test" and RR system not operating	NA	• No
Condensate demineralizer	• Install condensate demineralizer filtered bypass strainer to permit one demineralizer to be removed under CPPU conditions	No	• Monitor chemistry • Establish flow baseline measurements	• With filtered bypass in service, monitor flows under various EPU conditions • Monitor reactor water chemistry	• No
Feedwater system suction pressure trip	• Protect feed pumps (RFP) with two sequential levels of low suction pressure trips at various time delays to ensure only one pump trips at a time and for high power RR pump runback to ~60% on loss of a Feed Pump • Modify trip logic to prevent common mode failure due to loss of RFP low flow circuits	No	• Channel calibration • Test with breakers in "Test" position	NA	• No
Cooling tower/fan motors	• Replace fan blades with more efficient blades and drive motors with upgraded higher performance motors	No	• Cooling tower performance monitoring	NA	• No

Modification	Description	Potential Impact on Transient Response?	Post Mod Testing	EPU Startup Testing	Further Tested by Load Reject Without Bypass / Main Steam Isolation Valve Closure
EQ Upgrades	• Reroute feed to SRV monitor to new breaker	No	• Voltage check and megger	NA	• No
Grid Stability	• Increase the rating (million volt-ampere (MVA)) of the Vermont Yankee-Northfield 345kV line from 896 MVA to a minimum rating of 1075 MVA • Increase MVA rating on the Ascutney-Coolidge 115 kV line from 205 MVA to 240 MVA • Addition of 60 MVAr of shunt capacitors at the Vermont Yankee 115 kV bus • Modification to provide a second primary protection scheme on the Vermont Yankee north bus • Addition to provide a second primary protection scheme on the Vermont Yankee main generator • Independent pole tripping on the Vermont Yankee 381 breaker • Addition of out of step protection for the Vermont Yankee generator	No	• Voltage checks • Logic checks • Relay calibration	• In-service testing of the 345kV and 115 kV primary/ secondary protective relay, line carrier system (Monthly)	• No
Main turbine – HP flow path	• Replace HP Turbine steam path (new HP diaphragms and rotor) • New control cams, camshafts and hydraulics New control valve settings • Modify control valve operating mechanism with 5% margin above CPPU • Modify turbine control and overspeed setpoint for CPPU conditions • New Hydrogen Coolers	No	• Factory 120% trip test • Overspeed testing • Control and stop valve response testing • Vibration baseline measurements • EPR and MPR tuning	• Overspeed testing • Vibration monitoring • EPR and MPR Testing per Power Ascension Test Plan (PATP) • Control and stop valve testing	• No

Modification	Description	Potential Impact on Transient Response	Modeled in Transient Analysis	Post Mod Testing	EPU Startup Testing	Further Tested by Turbine Trip / Main Steam Isolation Valve Closure
Electronic pressure regulator (EPR) setpoint change	• Change in EPR setpoint control range and zero power setpoint based on higher steam line differential pressure (dp) • Rescale bypass relay to account for bypass valve capability of 89% of total steam flow • Expand EPR control band from current range of 900 to 1000 psig a new range of 850 to 1000 psig • Install signal isolators to minimize EPR output test wiring fault from negatively affecting EPR operation • Add second notch filter function to programmable logic controller (PLC) software and tune to remove an 8.8 Hz signal	Yes	Yes	• Wire continuity checks • PLC calibration • EPR and MPR tuning	• EPR and MPR testing per PATP	• No

Modification	Description	Potential Impact on Transient Response	Modeled in Transient Analysis	Post Mod Testing	EPU Startup Testing	Further Tested by Turbine Trip / Main Steam Isolation Valve Closure
Feedwater Isokinetic Probes	• Replace Sample Probes	No	No	• Leak Check process boundary	• No	• No
Feedwater Pump Automatic Trip	• Trip Feedwater Pump on Loss of Condensate Pump	No	No	• Circuit/Logic Tests	• Yes - Condensate Pump Trip Test	• No

MR. TRAVIESO-DIAZ: Now, Mr. Nichols and Mr. Casillas, do you have in front of you a document bearing the caption of this proceeding, dated June 14, 2006, and entitled Rebuttal Testimony of Craig J. Nichols and Jose L. Casillas, on NEC Contention 3, Large Transient Testing?

WITNESS NICHOLS: I do.

WITNESS CASILLAS: I do.

MR. TRAVIESO-DIAZ: Was this testimony prepared by you, or under your direct supervision and control?

WITNESS NICHOLS: Yes.

MR. TRAVIESO-DIAZ: Do you have any corrections to make to this testimony?

CHAIR KARLIN: Let's make sure we get everyone's answer.

MR. TRAVIESO-DIAZ: Yes, Mr. Casillas you have to answer, also.

CHAIR KARLIN: And try to speak up because, again, we have no PA system here.

WITNESS CASILLAS: Yes.

CHAIR KARLIN: Thank you.

MR. TRAVIESO-DIAZ: Do you have any corrections to make to this testimony?

WITNESS NICHOLS: I do not.

WITNESS CASILLAS: No.

MR. TRAVIESO-DIAZ: Is this testimony true and correct to the best of your knowledge and belief?

WITNESS CASILLAS: Yes.

WITNESS NICHOLS: Yes.

MR. TRAVIESO-DIAZ: Do you adopt it as your sworn rebuttal testimony in this proceeding?

WITNESS CASILLAS: I do.

WITNESS NICHOLS: Yes.

MR. TRAVIESO-DIAZ: I would like, again, to have this rebuttal testimony at this point bound into the transcript as if read.

CHAIR KARLIN: Any objections?

(No response.)

CHAIR KARLIN: Hearing none it will be entered into the transcript as if read.

(Whereupon, the Prefiled Rebuttal Testimony of Craig Nichols and Jose Casillas was bound into the transcript as if having been read.)

June 14, 2006

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

Before the Atomic Safety and Licensing Board

In the Matter of ENTERGY NUCLEAR VERMONT YANKEE, LLC and ENTERGY NUCLEAR OPERATIONS, INC. (Vermont Yankee Nuclear Power Station)	))))))))	Docket No. 50-271 ASLBP No. 04-832-02-OLA (Operating License Amendment)

REBUTTAL TESTIMONY OF CRAIG J. NICHOLS AND JOSE L. CASILLAS ON NEC CONTENTION 3 – LARGE TRANSIENT TESTING

June 14, 2006

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NUCLEAR REGULATORY COMMISSION

Before the Atomic Safety and Licensing Board

In the Matter of	)	
	)	Docket No. 50-271
ENTERGY NUCLEAR VERMONT YANKEE, LLC and ENTERGY NUCLEAR OPERATIONS, INC.	)	ASLBP No. 04-832-02-OLA (Operating License Amendment)
(Vermont Yankee Nuclear Power Station)	)	

REBUTTAL TESTIMONY OF CRAIG J. NICHOLS AND JOSE L. CASILLAS ON NEC CONTENTION 3 – LARGE TRANSIENT TESTING

I. INTRODUCTION

Craig J. Nichols ("CJN")

Q1. Please state your full name.

A1. (CJN) My name is Craig J. Nichols.

Q2. By whom are you employed and what is your position?

A2. (CJN) I am the Extended Power Uprate Project Manager for Entergy Nuclear Operations, Inc. ("Entergy"). In that capacity, I am the manager for the implementation of the extended power uprate ("EPU") at the Vermont Yankee Nuclear Power Station ("VY").

Q3. Have you previously provided written testimony in this proceeding?

A3. (CJN) Yes. I was co-sponsor with Mr. Jose L. Casillas of direct testimony dated May 17, 2006 entitled "Testimony of Craig J. Nichols and Jose L. Casillas on NEC Contention 3 – Large Transient Testing." "Entergy's Direct Testimony."

Jose L. Casillas ("JLC")

Q4. Please state your full name.

A4. (JLC) My name is Jose L. Casillas.

Q5. By whom are you employed and what is your position?

A5. (JLC) I am the Plant Performance Consulting Engineer in the Nuclear Analysis group of the Engineering organization of General Electric Nuclear Energy ("GE"). In that capacity, I am responsible for boiling water reactor ("BWR") plant performance design and analyses, including evaluations in support of EPU applications and the development and application of computer codes used to predict BWR plant performance.

Q6. Have you previously provided written testimony in this proceeding?

A6. (CJN) Yes. I was co-sponsor, with Mr. Craig J. Nichols, of Entergy's Direct Testimony.

Q7. What is the purpose of your testimony?

A7. (CJN, JLC) The purpose of our testimony is to respond, on behalf of Entergy Nuclear Vermont Yankee, LLC and Entergy Nuclear Operations, Inc. (collectively "Entergy"), to certain materials submitted by the New England Coalition ("NEC") on May 17, 2006 regarding NEC Contention 3 in this proceeding. As admitted by the Atomic Safety and Licensing Board ("Board"), NEC Contention 3 reads:

> The license amendment should not be approved unless Large Transient Testing is a condition of the Extended Power Uprate.

Memorandum and Order, LBP-04-28, 60 NRC 548, 580, App. 1 (Nov. 22, 2004).

In addition, the scope of NEC Contention 3 has been clarified by the Board, which has ruled that "the 'Large Transient Testing' ["LTT"] at issue in NEC Contention 3, and the testimony and other evidence to be submitted concerning it, are limited to the main steam isolation valve ["MSIV"] closure test and the turbine generator load rejection test." Memorandum and Order (Clarifying the Scope of NEC Contention 3) (April 17, 2006), slip op. at 3.

Q8. To what materials submitted by NEC regarding NEC Contention 3 are you responding?

A8. (CJN, JLC) Our response is directed at (a) "New England Coalition's Statement of Position" ("NEC Statement") dated May 17, 2006; (b) the "Prefiled Direct Testimony of Dr. Joram Hopenfeld Regarding Contention 3" ("Hopenfeld Testimony") dated May 17, 2006, and (c) the "Declaration of Dr. Joram Hopenfeld Supporting New England Coalition's Response to ENVY's Motion for Summary Disposition" ("Hopenfeld Declaration") dated December 21, 2005. The Hopenfeld Declaration is incorporated by reference into the Hopenfeld Testimony at A13.

II. DISCUSSION

A. Issues Raised By NEC Direct Case Filing

Q9. What issues are raised by Dr. Hopenfeld in his Testimony and his Declaration?

A9. (CJN, JLC) Dr. Hopenfeld asserts: that (1) there is no evidence that the ODYN code that is used for transient analyses at VY has been benchmarked for the type of transients that have been analyzed at EPU conditions, or of how the ODYN code was benchmarked for steady state operations (Hopenfeld Testimony at A8 and A9; Hopenfeld Declaration at 3, ¶ 9c); (2) computer codes and analyses cannot be used as a substitute for testing (Hopenfeld Declaration at 5, ¶ 14); (3) the operational experience at other plants cannot be relied upon to substitute for LTT because plant design and operating and maintenance history are plant-specific and influence plant response to transients (id. at 4, ¶ 11); (4) VY operational experience at a 100% (pre-EPU) power level cannot be relied on to predict that the plant will operate safely under transients occurring at the EPU (120%) power level (id. at 5, ¶ 12); and (5) the VY steam dryer's structural integrity could be affected by EPU operation and LTT is needed to establish whether this is the case (Hopenfeld Testimony at A8, A10; Hopenfeld Declaration at 2-3, ¶ 9a).

Q10. What issues does NEC raise in its Statement?

A10. (CJN, JLC) NEC's Statement asserts that "component testing, piecemeal ascension testing, and inappropriately applied predictive computer codes" may not be substituted for "integral Large Transient Testing." Statement of Position at 13. In support of its assertion, NEC quotes extensively from statements made at meetings of the Advisory Committee on Reactor Safeguards ("ACRS"), none relating to Entergy's EPU Application at VY but to that at another plant (the Waterford plant, a pressurized water reactor quite different from VY). NEC Statement at 9-13.

B. Benchmarking of ODYN Code

Q11. Can the behavior of the VY plant during a large transient be bounded analytically?

A11. (CJN) Yes. The large transient analyses for VY, which were performed using the NRC-approved code ODYN, predict the behavior of the safety- and non-safety-related systems in the plant during operational transients. These large transient analyses model both the performance of the secondary side of the plant and any relevant potential interactions between primary and secondary systems in a transient to evaluate the parameters of interest.

Q12. Please provide a summary description of the ODYN code.

A12. (JLC) ODYN is a proprietary code developed by GE and approved by the NRC in 1981 for use in the analysis of GE BWR plant response to pressurization transients. A description of the ODYN model and the qualification turbine trip tests as well as the USNRC Safety Evaluation Report can be found in NEDO 24154-A, Volumes 1 and 2 respectively, dated August 1986. (A copy of the NEDO 24154-A, report, vols. 1 and 2 will be provided on June 19, 2006 pursuant to the Board's June 5, 2006 Order Regarding Submission of Supplemental Documents). Volume 3 of this report (proprietary) contains the procedure for licensing applications to pressurization transient analyses. A more recent (1998) Volume 4 of this report (proprietary) contains the qualification and application of ODYN to the complete range of core wide transients. I prepared a summary of the key information contained in each of the four volumes, as it pertains to the qualification of the model and its application to BWR safety analyses. The summary is included as Exhibit 1 hereto.

The ODYN model has been upgraded over the last 20 years to include greater modeling detail such as increased nodes, advanced physics correlations, and more representative control systems. These changes have consistently improved the accuracy of the ODYN code and reduced the uncertainty in its predictions compared against the qualification tests.

Q13. How does the ODYN code model the behavior of BWRs such as VY during large transients?

A13. (JLC) The ODYN code models BWR vessel physical components, mechanical equipment functions, control systems and nuclear/thermal-hydraulic phenomena. The simulation involves describing the physical plant in the model (i.e., volumes, flow paths, resistances), establishing the desired operating conditions (i.e., water level, power, pressure) and introducing a disturbance (i.e., valve closure, pump trip, control action). The ODYN model predicts the plant response behavior based on its physical model correlations.

The ODYN analyses assume operational configurations and component/system failures that bound (i.e., represent more severe conditions than) the transients that would occur during normal plant operations or design basis events, including large transients.

Q14. Dr. Hopenfeld asserts in A8 of his Direct Testimony that "Entergy does not state that the ODYN code was benchmarked for pressurized transients nor does it discuss how the ODYN code was benchmarked for steady state operations." What are pressurized transients and has the ODYN code been benchmarked for such transients?

A14. (JLC) Pressurized transients (or "pressurization transients") involve fast pressure increases caused by closure of valves in the vessel steam piping. Both the MSIV closure and the generator load rejection are pressurization transients.

As stated in Entergy's Direct Testimony at A36, the ODYN code has been benchmarked against turbine trips (equivalent in their effects to generator load rejection trips) and main steam valve isolation events. The turbine trip data were obtained from the Peach Bottom and KKM plants; the MSIV closure data were obtained from the Hatch plant. See Exhibit 1. The Peach Bottom turbine trip tests used to benchmark the ODYN code represented more severe conditions than those observed in actual plant transient events, in that the reactor trip was purposefully delayed to increase the severity of the transient. The ODYN model is based on physical correlations that are applicable over wide range of parameters that are even beyond the acceptable licensing ranges. Therefore, the ODYN code is fully qualified for the VY pressurization transients. Performance of LTT at VY would not challenge the facility nearly as much as the Peach Bottom tests used in the ODYN qualification.

Q15. Has ODYN been benchmarked for steady state operations?

A15. (JLC) No, because it did not need to be. The purpose of the ODYN code is to predict the transient behavior of key vessel parameters, such as dome pressure and core power, not to evaluate the plant's initial, pre-transient conditions.

The operating parameters assumed by ODYN at the start of the transient reflect the plant steady state conditions calculated by appropriate, and more detailed, steady state modeling codes. For example, the axial power distribution in ODYN at the start of the transient is based on that calculated by the 3-Dimensional Nuclear Reactor code. Likewise, the flow inside the fuel assemblies is based on that calculated by the multi-channel detailed thermal hydraulic model. Therefore, the steady state conditions utilized by ODYN reflect the best representation of the status of the reactor before the transient and provide a consistent basis for the transient solution.

Q16. Dr. Hopenfeld states in his Declaration at ¶ 9.c that "ENVY failed to state whether the ODYN code was specifically designed and verified (benchmarked) for the type of transients they have analyzed at EPU conditions. ENVY has not referenced any prototypic separate effects, or system transient tests that were conducted at EPU conditions." Has ODYN been benchmarked against the specific conditions that will be encountered during MSIV closure and generator load rejection transients at VY?

A16. (JLC) As has been stated before, the ODYN code is fully qualified (and benchmarked against plant data) for the type of pressurization events that result from plant transients. Furthermore, the ODYN code physical correlations, such as hydraulic losses, flow characteristic, and fluid, material and nuclear properties are applicable for ranges beyond the bounds of the VY licensing analyses. The key plant equipment performance from pressurization transient considerations, such as valve stroke characteristics, control rod insertion and relief valve actuation are not affected by implementation of the EPU. Component and system testing validate that these parameters remain within analysis input assumptions.

Q17. Dr. Hopenfeld further states in A9 of his direct testimony that "if the ODYN computer code employs inaccurate models, the predicted behavior of the VY reactor during transients will include large uncertainties. For example, closure of the MSIVs, due to operator error or LOCA redirects the flow of steam into the containment suppression pool. The uncertainties in predicting loads under these conditions must be quantified at EPU flow rates." How do you respond to Dr. Hopenfeld's concerns?

A17. (JLC) The ODYN code is applied to pressurization events to demonstrate compliance to both the vessel overpressure and overpower criteria including appropriate margin for uncertainties. The ODYN code analyses do not apply to other plant conditions, such as a LOCA, which are subject to different analyses. Therefore, the alleged modeling errors and uncertainties in predicted loads that are of concern to Dr. Hopenfeld are irrelevant to the issues raised in NEC Contention 3.

C. Use of Computer Codes and Analyses as a Substitute for Testing

Q18. Why is it reasonable to conclude that the ODYN simulations of VY's behavior in large transients during EPU operation accurately predict the actual plant response to those transients?

A18. (JLC) The ODYN model is qualified for the analysis of large transients and the resulting parameters are within the applicable physical correlations of the model for the bounding licensing analysis. Also, a VY LTT at the increased power condition at constant pressure would be significantly milder than those assumed in the ODYN analyses. Several VY transients have been compared against ODYN predictions over the years to assess the specific BWR licensing basis. All of these comparisons have determined that the ODYN predictions are bounding and that the plant equipment response is consistent with its design basis. See Exhibits 9-16 to the Direct Testimony. Furthermore, GE has simulated in detail some of the transients for the purpose of revising the equipment response or setpoints in order to improve the plant response. See Exhibit 2. None of these simulations has shown any ODYN model deficiency with respect to its licensing and qualification basis. Therefore, GE would not expect any model qualification benefit if the LTTs were performed at VY.

Q19. In ¶ 14 of his Declaration, Dr. Hopenfeld asserts that Entergy has made "the erroneous assumption that computer codes and analysis can be used as a substitute for testing. We strongly disagree with this approach; one of the main purposes of the transient testing is to discover unforeseen component behavior or operator actions." How do you respond to these assertions?

A19. (JLC) Dr. Hopenfeld's argument is misleading. While the results of LTT at EPU in VY would differ from those of tests that have been conducted at VY in the past, the LTT from EPU would not result in new conditions or phenomena that are beyond the equipment (valve stroke characteristic, rod insertion and relief valve actuation) qualification. All the LTT would accomplish is further validate the ODYN model predictions, which is unnecessary because, as discussed earlier, the ODYN model has been benchmarked and qualified for conditions that exceed those that would be experienced at VY during transients.

With respect to "operator actions," there are no operator actions required in the LTT, thus performance of the tests would shed no light on "operator actions."

D. Reliance on operational experience at other plants as a substitute for LTT

Q20. What industry experience confirms the basic transient analysis methodology used by Entergy at VY?

A20. (JLC) Of the thirteen BWR plants that have implemented EPUs without increased reactor operating pressure, four (Hatch 1 and 2, Brunswick 2, and Dresden 3) have experienced one or more unplanned large transients from uprated power levels. These transients are discussed in Entergy's Direct Testimony at A44.

Q21. Dr. Hopenfeld states on ¶ 11 of his Declaration that plant operating experience shows that plant events depend on plant design, plant operating and maintenance history, and quality assurance during construction and that, because these are plant specific variables, Entergy must demonstrate "that the design and operating histories of the cited plants are the same as the design and operating history of the Vermont Yankee plant" before it can take credit for other plant's response to plant events as a substitute for LTT. Do you agree with that position?

A21. (JLC) Not entirely. The plants have to be analogous in the relevant aspects of the design that one wishes to compare; thus, operational experience with steam generator issues in pressurized water reactors is inapplicable to BWRs. However, having identical "design and operating histories" is not necessary in order to draw valid inferences from plant operating experience. For example, the Entergy Direct Testimony at A16 shows the significant similarities between VY and the Brunswick units, so that it is reasonable to predict that the performance of both plants in the event of a large transient would be substantially the same with respect to transients experienced under EPU operations. Also, while specific equipment performance can vary depending of several factors, the safety analyses apply the limiting performance bounds consistent with design specifications, thus assuring conservative results.

E. Reliance on VY operational experience at a pre-EPU 100% power level

Q22. Has VY experienced large transients during its operating lifetime?

A22. (CJN) Yes. VY has previously experienced several unplanned transients, most recently in 2004 and 2005. Those are discussed in Entergy's Direct Testimony at A49 – A50. As described there, no significant anomalies were seen in the plant's response to these transients. The performance of VY in the transients it experienced at pre-EPU power levels was well within the bounds of the ODYN analyses.

Q23. Does VY's historical response to large transients provide a basis for an exception to LTT?

A23. (CJN) Yes. In particular, the transients in 2004 and 2005 occurred after most of the modifications associated with EPU were already implemented, including the new HP turbine rotor, Main Generator Stator rewind, the new high pressure feedwater heaters, condenser tube staking, an upgraded isophase bus duct cooling system, and condensate demineralizer filtered bypass. In each instance, the modified or added equipment functioned normally during the transient. The plant's performance during these recent transients, including that of the modified components, demonstrates that the EPU modifications do not significantly affect the plant's response during transient conditions.

Q24. Dr. Hopenfeld's Declaration at ¶¶ 12-13 charges that Entergy's reliance on its operational experience is based on speculation, not hard data, and asserts that "ENVY has not provided any relevant data showing that the plant will operate safely and efficiently when the transients are initiated at the relatively high EPU flow rates where high dynamic loads could be created during the transient adversely affecting its mitigation." What is your response to his objections?

A24. (CJN) Determination of dynamic loadings on components is not the purpose of either the large transient analyses performed by ODYN or the LTT themselves. The purposes of both the analyses and the LTT are to determine 1.) the peak pressure transient in the case of the MSIV closure, or 2.) the greatest transient challenge to the reactor thermal limits in the case of the generator load rejection. Dynamic loadings of components under normal, upset, or faulted conditions (including transients) are covered in separate analyses and acceptance criteria. Determination of such loadings has no relation to large transient analysis, LTT, or this contention.

F. Effect of the VY Uprate on Steam Dryer's Structural Integrity

Q25. Dr. Hopenfeld states in his Testimony at A10 that "increase in flow velocity at EPU conditions, steady state temperature and pressure fluctuations will increase the fatigue usage factor of the steam dryer. This increase in fatigue together with the increase in fatigue during transients must be taken into account to show that the cumulative fatigue factor at EPU conditions will remain below A.S.M.E. allowable limits." What information do the MSIV closure and the generator load rejection tests provide relevant to steam dryer fatigue usage factor?

A25. (JLC) None. LTT provides information on the peak reactor vessel pressure and power level (i.e., temperature increase) resulting from the pressurization caused by the large transients. Performance of LTT would not provide information for use in deriving either fatigue factors on the steam dryer or the loadings to which the dryer will be subjected.

Q26. Dr. Hopenfeld also claims that "[i]t is preposterous for ENVY to claim that transient testing at the 120% power level is not required in the light of the Quad Cities dryer failure. Load variations and insufficient full scale testing resulted in the unexpected failure of the dryer." Would LTT provide and information that would determine loads on the steam dryer?

A26. (JLC) No. LTT does not provide information that could be used to determine steam dryer loadings.

Q27. In his Testimony at A11 Dr. Hopenfeld provides the following prescription for things that Entergy should do to "demonstrate that the fatigue usage factor of critical components will remain below the relevant A.S.M.E. code limits:

1. Walk around the plant and identify those components that are most susceptible to failure by flow-induced vibrations.

2. Identify the parameters (pressure, neutronic response) that can be used to compare plant behavior during MSIVs closure and load rejections to ODYN predictions under VY- EPU conditions.

3. Compare ODYN predictions with Peach Bottom data

4. If a good agreement is not obtained in 3 above, show that transient tests are not required in spite of the differences between Peach Bottom and VY."

What is your response to Dr. Hopenfeld's prescription?

A27. (JLC, CJN) In response to Dr. Hopenfeld's four point prescription:

1. VY performed extensive plant-specific flow induce vibration (FIV) analyses and then as part of the Power Ascension Test Program used monitoring and observation (by walking around the plant follow-

ing power level changes) of systems and components to determine if there were any FIV issues.

2. As discussed earlier, the parameters of interest predicted by ODYN are peak reactor vessel pressure and power level.

3. As also discussed earlier, ODYN has been successfully qualified against the Peach Bottom tests and these represent a significant degree of pressurization beyond what would be experienced in a VY LTT.

4. ODYN's predictions matched closely the Peach Bottom test data used to benchmark the program.

In short, Entergy has performed precisely each of the actions that Dr. Hopenfeld would require in order to resolve his concerns.

Q28. Do Dr. Hopenfeld's concerns relate to LTT?

A28. (JLC) Not at all.

G. Reliance on System and Component Testing

Q29. Does system and component testing during normal operations provide an adequate basis for an exception to LTT?

A29. (CJN) Yes. Technical Specification-required surveillance testing (e.g., component testing, trip logic system testing, simulated actuation testing) is routinely performed during plant operations. Such testing demonstrates that the structures, systems and components ("SSCs") required for appropriate transient performance will perform their functions, including integrated performance for transient mitigation as assumed in the transient analysis.

Q30. What is the significance of the system and component testing program?

A30. (CJN) Because the characteristics and functions of SSCs are tested periodically during plant operations, they do not need to be demonstrated further in a large transient test. In addition, limiting transient analyses (i.e., those that affect core operating and safety limits) are re-performed for each operating cycle and are included as part of the reload licensing analysis.

Q31. NEC quotes at length from discussions at meetings of the Advisory Committee on Reactor Safeguards to assert that "component testing, piecemeal ascension testing, and inappropriately applied predictive computer codes" may not be substituted for "integral Large Transient Testing." Statement of Position at 13. How do you respond to NEC's allegations?

A31. (JLC) The discussions at the ACRS meetings cited by NEC are inapplicable, since they refer to a different type of plant (PWR) rather than BWRs such as VY. In addition, the excerpts quoted seem to reflect the view of a single ACRS member (Mr. Rosen) and not the prevailing view of the ACRS. In fact, as noted in the Direct Testimony at A59, the ACRS specifically concluded that LTT was not needed at VY, and wrote: "Load rejection and main steam isolation valve closure transient tests are not warranted. The planned transient testing program adequately addresses the performance of the modified systems."

In any case, the experience of the BWR fleet is that the transient events of concern here are well understood, and the key equipment has been observed to perform as designed. Furthermore, the qualification of the ODYN code against more challenging pressurization events than those that would occur during plant operations (or during LTT) assures that its application to EPU conditions is sound.

III. SUMMARY AND CONCLUSIONS

Q32. Please summarize your rebuttal testimony.

A32. (CJN, JLC) Our rebuttal testimony can be summarized as follows:

- The ODYN Code has been benchmarked against pressurization transients representing more severe conditions than those that would be experienced at VY in large transients from EPU conditions.

- Performance of LTT from EPU would not result in a new condition or phenomena that is beyond the equipment (valve stroke characteristic, rod insertion and relief valve actuation) qualification.

- Having identical "design and operating histories" is not necessary in order to draw valid inferences from operating experience at other plants similar to VY.

- Performance of LTT from EPU would not result in new conditions or phenomena beyond the equipment qualification.

- VY's performance during the 2004 and 2005 pre-EPU transients, including that of the components modified for the uprate, demonstrates that the EPU modifications do not significantly affect the plant's response during transient conditions.

- Dynamic loadings of components under normal, upset, or faulted conditions (including transients) are determined in separate analyses and acceptance criteria. Determination of those loadings has no relation to large transient analyses or LTT.

- Performance of LTT would not provide information for use in deriving either fatigue factors on the steam dryer or the loadings to which the dryer will be subjected.

- Because the characteristics and functions of SSCs are tested periodically during plant operations, they do not need to be demonstrated further in a large transient test.

- The experience of the BWR fleet is that large transient events are well understood, and the key equipment has been observed to perform as designed during them.

- The qualification of the ODYN code against more challenging pressurization events than those that would occur during plant operations (or during LTT) assures that its application to EPU conditions is sound.

Q33. What overall conclusions do you draw after reviewing NEC's Statement of Position and the Testimony and Declaration of Dr. Hopenfeld?

A33. (CJN, JLC) Nothing in NEC's Statement or the testimony of Dr. Hopenfeld undercuts our earlier conclusion that the extensive and conservative engineering analyses, historical test and actual transient data, individual component testing, and observed performance at other plants experiencing large transients provide assurance and confidence that VY systems will function as designed in mitigation of large transients from EPU conditions. Therefore, Entergy's request for an exception to LTT at VY is reasonable and poses no threat to public health and safety.

Q34. Does that conclude your rebuttal testimony?

A34. (CJN, JLC) Yes, it does.

MR. TRAVIESO-DIAZ: Mr. Nichols and Mr. Casillas are available for examination.

CHAIR KARLIN: Thank you, thank you. Welcome, Mr. Nichols and Mr. Casillas. Mr. Casillas, am I pronouncing that right?

WITNESS CASILLAS: That is correct.

CHAIR KARLIN: Very good. We are going to ask you some questions. And happily I have two highly expert technical judges sitting at my side to deal with this.

We will try to proceed in some order. If any of us ask you a question that you don't understand, or you need to break it into some pieces, or something, please let us know before answering.

If you didn't understand the question, you didn't hear it clearly, if you need a break at any time as we are going along, let us know, we can do that. I think we will go for an hour or so. We will see how it goes.

If you think there is an exhibit, a document that you need to refer to in testifying, or speaking, or responding to one of our questions, please let us know. I think we can find it if you need to refer to it.

And, you know, unless we ask you for an

opinion of expertise, or something, generally what we are asking is what you know, what you saw, what you personally can testify to.

So thank you for coming. We will start with Judge Rubenstein.

ADMINISTRATIVE JUDGE RUBENSTEIN: Good morning. I want to alert the other parties that some of the same questions will be repeated, so you may want to listen closely to the questions and the answers when your turn comes.

In order to get everybody off on a proper foot we are going to start with some questions on defining the transients, specifically for the current existing version of Vermont Yankee AGBWR Mark 1 containment.

Describe the three transients at issue, assuming they occur at CPPU, constant power, constant pressure power uprate. Can everyone hear me, or should I speak up? I will try to get it up a notch.

And please distinguish between them when you talk about past closure of the main steam isolation valve with valve position switch scram, fast closure, and I'm going to start to use a little jargon of the MSIV, main steam line isolation valve, with a backup flux scram, and finally load rejection from high power.

And if you go slowly it will give me an opportunity to ask you questions. For example, when you talk about fast closure, I want to ask you a question. What do you mean, three seconds? So you start and either one, and you consult among yourselves at any given time. But don't both speak at once.

WITNESS CASILLAS: You mentioned three seconds. I did not catch that.

ADMINISTRATIVE JUDGE RUBENSTEIN: You tell me, that is a question I gave you for example. And at the time you can talk about the reality, and you can talk about what may be used in ODYN.

WITNESS NICHOLS: I'd like to start, and to make sure I'm clear you asked about three transients, that is the MSIV closure with the position scram, the MSIV closure with the flux scram, and the load reject from high power?

ADMINISTRATIVE JUDGE RUBENSTEIN: That is correct.

WITNESS NICHOLS: And I will start with the MSIV closures. The MSIVs are the main steam isolation valves of which there are eight, two on each of the main steam lines. They receive what is called a group one isolation signal for the primary containment.

These are primary containment isolation valves. In normal operations these valves shut when any two of those valves are less than 90 percent open, the limit which is on the valve will initiate a reactor scram.

So in the first event if for some reason, real or not intended, a signal, a group one isolation signal is given, and the valves start to shut, as soon as those first two start to shut, and they take approximately, by our tech specs, within three to five seconds to shut, and those are timed during refueling outage tests.

And they are subsequently tested, online, one at a time. Because if any two of them were tested at once we would get the scram.

ADMINISTRATIVE JUDGE BARATTA: Could I ask a question of clarification? You said 90 percent open. Is that 90 percent of the valve area, or 90 percent of the stroke?

WITNESS NICHOLS: That is 90 percent of the valve stroke.

ADMINISTRATIVE JUDGE BARATTA: And is there, can you estimate, at that point, what the valve area would be?

WITNESS NICHOLS: It is still,

essentially, full open. They are angle flow valves. And when they get past about 50 percent open, they are full open.

So to continue with the event, is that the main steam isolation valves start to shut, again it takes between three to five seconds, depending on their timing, and as required by tech specs.

As they start to go shut and reach that ten percent closed, or 90 percent open, the reactor scram signal will occur, effectively shutting down the reactor in less than three seconds.

ADMINISTRATIVE JUDGE RUBENSTEIN: And this is based on the valve position indicated?

WITNESS NICHOLS: That is correct. There are environmentally qualified limits which is attached on each of the eight valves that will initiate those signals to the reactor protection system, to shut down the reactor.

ADMINISTRATIVE JUDGE RUBENSTEIN: So the signal comes from the fastest moving valve?

WITNESS NICHOLS: It would come from the two fastest moving valves.

ADMINISTRATIVE JUDGE RUBENSTEIN: This is so you have duplicate logic?

WITNESS NICHOLS: That is correct.

Redundancy and protection. And what that single valve, not tripping on a single valve allows us is quarterly we stroke each of those valves, partially shut, to ensure that those limits work.

So the next sequence of events is the reactor scram, or shutdown occurs. Since the main steam isolation valve closure results in the isolation of the main condenser, through the primary containment isolation we see a pressure increase.

That pressure increase is an addition of positive reactivity. But because the reactor scram has occurred, driving in all 89 control rods, that reduction in power is offsetting the positive reactivity, and the reactor will shut down. There will be a slight increase in pressure, as necessary, operators would act to open safety relief valves.

There are four safety relief valves, one on each main steam line. They are operated either manually by station operators, from the control room, or if the pressure set point for them to be reached, they would lift automatically.

And those are used to control that pressure increase for the reactor and relieve the steam.

ADMINISTRATIVE JUDGE RUBENSTEIN: I

believe you said that the pressure increase is offset by the scram decrease in moderator?

WITNESS NICHOLS: Yes.

ADMINISTRATIVE JUDGE RUBENSTEIN: How do you know this?

WITNESS NICHOLS: That is just physics, as done by the ODYN code.

ADMINISTRATIVE JUDGE RUBENSTEIN: So this is a calculation value?

WITNESS NICHOLS: It is part of the ODYN analysis. Mr. Casillas could explain that one.

ADMINISTRATIVE JUDGE RUBENSTEIN: And the thrust of my question is ultimately to get at the magnitude and the frequency, and duration, of the pressure wave.

So it is important to know both the timing of the valve closure, and to know the condition of the core at that time. So specifically how do you calculate and -- how did you arrive at the conclusion of the compensation?

WITNESS CASILLAS: Let me answer that. What is occurring is that even before the pressure rises in the vessel the signal for shutdown has occurred, and the control rods have started going into the reactor.

And, in fact, by the time the -- any appreciable pressure increases in the reactor core, that would add positive reactivity, the control rods are so far into the core that the power excursion does never, really, exceed the initial power.

And, in fact, from many, many isolation events that have been observed in BWRs, we do not see power increase at all. And so what occurs, then, when the isolation is completed, then some of the relief valves will open to discharge, to relieve the pressure of that.

ADMINISTRATIVE JUDGE RUBENSTEIN: When you say that you did not see power increase, this is based on observations of the tips which happen to be in core, and the low power range monitors, and the source range monitor?

WITNESS CASILLAS: No, this is from the LPRMs, from the fission chambers, from the LPRMs.

ADMINISTRATIVE JUDGE RUBENSTEIN: Okay.

WITNESS CASILLAS: Those are instantaneous flux detectors. And so they detect any kind of instantaneous power increase.

ADMINISTRATIVE JUDGE RUBENSTEIN: So you have a direct measurement of --

WITNESS CASILLAS: Of the power, of the

flux, right.

ADMINISTRATIVE JUDGE RUBENSTEIN: What about the RPS logic, how is this affected? The RPS logic, does the pressure pulse affect this?

WITNESS NICHOLS: The pressure pulse, no. The RPS logic --

ADMINISTRATIVE JUDGE RUBENSTEIN: Or the scram?

WITNESS NICHOLS: Yes, the RPS logic is the inputs, inputs the reactor to that are those signals that would cause a reactor scram. In this particular case, under the event I described, the MSIV closure with position scram, it is those eight positions that provide the inputs.

There are other inputs, other scram signals, that can occur for the plant, such as low reactor water, low pressure with remote switch and run, etcetera. But those are not the initiators of this event.

If something were to happen in the results of this event, you could get additional scram signals, and we will talk about that in a minute, on the other event.

So in this case, as Mr. Casillas said, the reactor is shutting down very fast. By the time you see any appreciable pressure, or power increase, the reactor is shutting down.

What would happen in a real event, in the plant, is operators would operate the safety relief valve themselves, rather than waiting for an automatic action, they would take an action to cycle the valve, to maintain pressure within a certain band.

They would then go on to start one of the high pressure ECCS systems, and from our tour yesterday, we were in the high pressure coolant injection room, the HPCI room. And that is the larger of the two high pressure injection systems that are run with that steam that is bottled up.

And it would be used to both maintain steam pressure control, and residual heat removal, remove heat, decay heat from the reactor. Ultimately we have the reactor isolation cooling, which is a much smaller system, and there is a much finer control.

Operators might start on the high pressure coolant injector, depending on conditions, and then transfer over to the RCIC system, eventually bringing pressure down until we get below a certain set point where those systems transfer over to the low pressure systems, such as residual heat removal.

And we would just proceed to a normal

shutdown.

ADMINISTRATIVE JUDGE RUBENSTEIN: I take it the control rod insertion times are not affected?

WITNESS NICHOLS: That is correct because there is no appreciable pressure increase for, in the reactor, for the constant pressure power uprate, control rod insertion times are not changed.

ADMINISTRATIVE JUDGE RUBENSTEIN: What about the heat flux increase on the upper dome pressure, you really said, basically already, that you are controlling it?

WITNESS NICHOLS: Right.

ADMINISTRATIVE JUDGE RUBENSTEIN: But let's have a clear statement on that.

WITNESS NICHOLS: Although the pressure increase would --

ADMINISTRATIVE JUDGE RUBENSTEIN: You gave me a good complex system answer. But, basically, I want to know you controlled it so that there is no pressure increase in the upper dome, or you don't know?

WITNESS NICHOLS: There is a pressure increase in the upper dome.

ADMINISTRATIVE JUDGE RUBENSTEIN: Minimal or substantive?

WITNESS NICHOLS: Minimal. In this case the requirement is that it is less than the set point of the lowest safety valve. But in the case where the position scram occurs, we don't even come close to that, it would be maintained at the set points of the relief valves, probably a 50 to 100 pound increase, at most, and then dropping down.

ADMINISTRATIVE JUDGE RUBENSTEIN: And the set point for the relief valves is this 35 PSI?

WITNESS NICHOLS: No, the lowest safety valve is about 12 --

ADMINISTRATIVE JUDGE RUBENSTEIN: No, 35 below the 1250 PSIG.

WITNESS NICHOLS: To avoid any set point tolerance or leaking.

ADMINISTRATIVE JUDGE RUBENSTEIN: Yes. And this is to prevent weepage?

WITNESS NICHOLS: Correct. So that is an additional margin below that. That is a requirement of the analysis. For this event we would not even come close to it. For the other event that you talked to, that is the acceptance, or level one acceptance criteria.

ADMINISTRATIVE JUDGE RUBENSTEIN: So we will get to that?

WITNESS NICHOLS: Right.

ADMINISTRATIVE JUDGE RUBENSTEIN: Go ahead.

ADMINISTRATIVE JUDGE BARATTA: I didn't quite make out what you said there. Did you say the lowest safety valve setting was 1250 PSIG?

WITNESS NICHOLS: I don't recall that off the top of my head, that is an estimate.

ADMINISTRATIVE JUDGE RUBENSTEIN: As I recall that is what you had in the testimony, PSIG and the set point is 35 PSIG below that. I'm not testifying here --

WITNESS NICHOLS: There is no set point. The acceptance criteria is that.

WITNESS CASILLAS: Can I expand?

ADMINISTRATIVE JUDGE RUBENSTEIN: Please.

WITNESS CASILLAS: Yes. The plant such as Vermont Yankee, has relief valves and separate safety valves. The design of this plant is such that actuation of the safety valves is not a desirable condition.

Although there is no, they can be accredited, and there is no adverse safety impact of opening the safety valves. However, in terms of an optimization, the goal exists that when this frequent event, that is an isolation, a normal isolation occurs, the safety valves will not be actuated.

And so that is confirmed. Every cycle there is analysis performed for this type of an event. The design basis event, where you have bounding characteristics, and you do not credit all the trips, those -- the pressure can be calculated.

The calculated pressure may reach the safety valves and demonstrate that for the design basis event the pressure can be very much higher, but it will not exceed the vessel design criteria.

And so on the licensing event the upset vessel ASME code will be demonstrated to be met. However, the event that we see, from time to time, will not reach the -- will have a certain margin to the -- will demonstrate a margin to the safety valves, to the four safety valves.

ADMINISTRATIVE JUDGE RUBENSTEIN: Thank you.

ADMINISTRATIVE JUDGE BARATTA: Are these commonly referred to as the ASME code safety valves, is that what you are talking about?

(No response.)

CHAIR KARLIN: Let's get verbal.

ADMINISTRATIVE JUDGE BARATTA: I think

that was a yes.

WITNESS CASILLAS: That is correct, yes.

ADMINISTRATIVE JUDGE BARATTA: The ASME code, does it have a design pressure for, that this system is designed, or does this system have an ASME code design pressure?

WITNESS CASILLAS: That is correct, yes.

ADMINISTRATIVE JUDGE BARATTA: And what is that pressure?

WITNESS CASILLAS: It is 110 percent of the vessel design pressure. And that is 1375 gauge. So every safety analysis performs a design basis calculation that demonstrates the pressure to be less than that limit.

ADMINISTRATIVE JUDGE RUBENSTEIN: Want to go on to the next transient?

WITNESS NICHOLS: And the next event is the MSIV closure with flux scram, or delayed scram.

ADMINISTRATIVE JUDGE RUBENSTEIN: Right.

WITNESS NICHOLS: And this is the licensing basis analysis, and the questions on that I will turn to Mr. Casillas on the analysis that we do.

But in this case the event is similar to that, that I just described for the position scram, except in this design analysis we take an additional conservatism by ignoring the position scram. Although all eight valves would inject a scram signal, and any two would provide for a full scram, we ignore that, and therefore the scram does not occur until much later, and the valves are much further closed, and you have started the pressurization event, which gives you the positive reactivity at the time of still very high power.

Eventually the APRM, average power range monitors, that are fed from LPRMS that Mr. Casillas mentioned, or local power range monitors, will provide the scram signal.

That will, then, turn the reactivity event and shut down the reactor, but we see a much larger power, and pressure excursion, in this design event.

This is the design case, it is not what would happen in the plant, but it is done for conservative design purpose.

ADMINISTRATIVE JUDGE RUBENSTEIN: If one were to do an LTT, and one wanted not to do all the transients, would this be the bounding transient?

WITNESS NICHOLS: For the purpose of vessel pressurization, it is considered the bounding at normal operating transient. However, for a large transient test, we would not do the second one.

We would not defeat the position scrams to do a test. That is an unnecessary safety channel. So you would get, in a large transient test, the first event. Where as soon as the valves started going shut we would get the position scram.

ADMINISTRATIVE JUDGE RUBENSTEIN: What if one's major interest was in structural response of the core and the balancing plant?

WITNESS NICHOLS: That is not the goal to do that type of testing in a nuclear power plant. The only postulated test that would be done would be the MSIV closure with the position scram.

Those are tech spec instruments that must remain in service.

ADMINISTRATIVE JUDGE RUBENSTEIN: Go ahead. Please continue the answer to the question.

WITNESS CASILLAS: Yes. Let me say that this large transient test is really nothing new. Every BWR, when they started in the '60s, and in the early '70s, have always had this test done.

And, again, it is like it was stated earlier, it is part of the original plant startup process. And there is different confirmations. And so this test, as well as several other tests, are run.

And predictions are made as to the proper response of the system. And then different acceptance criteria to those tests are done. And so this is, these tests are for confirmation that the system is responding the way that it is expected to respond.

It is not a confirmation of any type of models. Certainly the understanding of what the system is going to do is based on our understanding of the models.

ADMINISTRATIVE JUDGE RUBENSTEIN: So the prototypical test that has been done has not necessarily targeted at the maximum structural response?

WITNESS CASILLAS: Absolutely not, no. No, it is not a -- again, and in fact it is very limited. The parameters that have always been examined is what is the peak pressure and what is the peak power that occurs during these tests?

And those values are confirmed. It is not, as was stated earlier, this test originate from the beginning of the life of the plant. And the models that we had, back in the '60s and the '70s, were a lot coarser than what we have today.

And we continue the same practice of confirming that the plant behaves as expected.

ADMINISTRATIVE JUDGE RUBENSTEIN: Well,

the tests, then test what, the response of the reactor control system? The fact that the structures, systems, and components important to safety all worked, is that the way you are postulating it?

WITNESS CASILLAS: Well, the --

ADMINISTRATIVE JUDGE RUBENSTEIN: If there is no, if we are not testing the largest structural demand on the plant, then we are reaffirming that the reactor control system responds?

WITNESS CASILLAS: Certainly you will confirm that the signals to shut down the reactor occur. You confirm that the safety systems respond as intended, that the relief valve and the makeup systems all respond as expected.

And, certainly, you can examine the behavior of the critical parameters as pressure and power, but you can examine almost every other parameter and determine as to their behavior.

ADMINISTRATIVE JUDGE RUBENSTEIN: Why would this be power dependent? What about, why would it differ between 8, 100, and 110 and 120 percent of power?

WITNESS CASILLAS: Well, the original plant startup is such where different testing was performed at different power levels. And so that tested different aspects of the plant behavior.

And so certainly there is the interest of what is the plant behavior at the maximum power. However, at the time that the plant is first built it is an entirely new system that has just been put together.

And as much testing that is done, there is the interest as to what is the behavior of the plant at those conditions. Now, once you have a plant that has been running for 10, 20 years, where you have had several events over its history, some at lower power, some at intermediate power, and some at the higher power, you have a much greater understanding of the behavior of the plant.

And so to perform another test at the new maximum power it is basically just an academic exercise. There is, really, nothing new from all the experience that you have.

WITNESS NICHOLS: If I could add to that?

CHAIR KARLIN: May I ask a question?

WITNESS NICHOLS: Sure.

CHAIR KARLIN: From a layman perspective, let me probe that. I have a car, I drive it at 100 miles an hour, and I slam on the brakes, and it stops before I hit the deer, or the child, and I am happy.

And now I say, well what about 120 miles an hour, will it stop? And you say it is not worth testing or deciding that, you know it stops at 100, so you don't need to test it, if it stops at 120.

I don't understand how you can say it is not worth checking that out if there is a child standing in your way, and you are doing 120 miles an hour.

WITNESS CASILLAS: Yes, indeed, but let me make the analogy that we --

CHAIR KARLIN: Is power of relevant factor here, how fast you are going?

WITNESS CASILLAS: Indeed, and that example is a good analogy. But, really, when it comes to the power plant, the example really, that is a better analogy is that the car is designed to survive, or to maintain the driver alive at 20 miles per hour.

And so there is tests, there is models that have been done to demonstrate that the design, when you hit a wall at 20 miles per hour, the driver will survive. So it doesn't make sense to go in and try every car to see if it would happen. You do not want to exercise the machine to any kind of a severe history.

CHAIR KARLIN: Well, let me follow-up on

that. I mean, the car crash test is a good analogy, and I'm thinking of the Volvo test where there are ten scientists standing around in their white lab coats, and clip boards, and there are cameras running, and there is all sorts of data being gathered, and there is dummies in the car that are being photographed.

WITNESS CASILLAS: Right.

CHAIR KARLIN: And has there ever been a large transient testing of MSIV closure done at 120 percent in the United States, on a BWR? You say you don't want to test every car. Has there ever been one tested at 120?

WITNESS CASILLAS: When you talk about a test, there has not.

CHAIR KARLIN: Okay.

WITNESS CASILLAS: Event --

CHAIR KARLIN: I understand that there are events, like cars hit the wall at 120 miles an hour, but an actual test with the scientists watching, and the people taking data down hasn't occurred.

So, I mean, your analogy is poor, perhaps, in the sense that you say, you don't want to test every car. My understanding is that there has never been a car tested at all. There have been cars that crashed, but never one that has been tested.

WITNESS NICHOLS: But I think the difference is that we can obtain the data. In the nuclear power plant the data we would take for a test, we already have the installed system.

So I'm saying they recently had one, they have all that data and can confirm, as we did, and we cite in our exhibits, at lower powers, that it worked per design.

CHAIR KARLIN: Well, let me ask that, then. Yes, is there additional, when there are large transient tests, in MSIV, I guess the closure test, the closure with position scram test is the one that we are talking about?

WITNESS NICHOLS: Yes.

CHAIR KARLIN: When that is done are there any additional measures taken? Let's say you have an event, data is gathered after the fact. You are not planning it, no one is watching particularly. Certain data is gathered, always, at a nuclear plant, it is a complex system, a lot of stuff going on.

When you do a large transient test like this, are any additional observations made, monitors, preparations?

WITNESS CASILLAS: Yes, these are unplanned events that you are talking about. Yes.

And, in fact, the LERs that were submitted are examples of all of these various events.

And, certainly, if you do a test you have a very controlled environment, and you determine what is happening. When an unplanned --

CHAIR KARLIN: What would be entailed in doing this test? What would, would additional people have to show up, would additional -- just tell me, what would you do if you were going to do this test? Would it cost anything, would it be additional effort? Or is it just no, never mind?

Tell me what you would do when you would do a large transient test, MSIV closure test. LEt me ask, have you ever done one?

WITNESS NICHOLS: We have not --

CHAIR KARLIN: Have you ever done it?

WITNESS NICHOLS: No. There have not been that many of them, tests. But similar to the power sanction testing we did, you would set up an organization, you would write up a procedure, okay? To do it in a very controlled fashion you would pick a time to do it.

Because it would result, obviously, in the plant going off line for a minimum of two to three days.

CHAIR KARLIN: You set up an organization of people?

WITNESS NICHOLS: Yes, just for -- because you know the plant is going to shut down, you would like to return it to power as soon as possible, you would write your test reports, so you would have those people there, okay?

CHAIR KARLIN: And how many people would you have to do the test?

WITNESS NICHOLS: To actually implement the test no additional people are required.

CHAIR KARLIN: Would there be scientists there to make additional observations?

WITNESS NICHOLS: After the fact of the event you would go into the computer system pull out what Mr. Casillas said were the two most important parameters, power and pressure. And those are tracked in about a millisecond's worth of data.

So you just go back in the computer and get that. What we would do is have engineers walk down the plant. During the tour, yesterday, Judge Rubenstein asked about snubbers, and what would happen.

And we would walk down the plant but that would happen whether the test occurred, or the actual events. So no data would be lost compared to an actual event.

CHAIR KARLIN: Okay. So if you were doing, if we said, or the NRC said you need to do this test, I'm trying to get at what specifically you would have to do. What would you do, if you planned this thing out ahead of time, you would want to gather as much data as you could from this event. And what would you do?

WITNESS NICHOLS: Knowing what I know about that test, or that transient, we would not need to install extra recorders, or things like that, because we have an advance computer system.

CHAIR KARLIN: Mr. Casillas could you address this?

WITNESS CASILLAS: I have reviewed many, many startup tests, and simulations, and performed special tests also at various power plants in order to gather information for application to optimize the plant.

And so what is typically done is you would determine what is the type of event that you expect in terms of all the equipment that it is going to be performed.

Then assure that all of that equipment,

that there is nothing out of the ordinary with that equipment, so that you would not be surprised. You are going to introduce an unexpected event, you do not want a second unexpected event from that.

So it is very important that all the key equipment be reviewed and determined that, yes, there is nothing unusual that we know.

CHAIR KARLIN: So you are saying that you inspect the facility carefully before the transient test was performed so you could have a pre-condition, and understand what the condition prior to the test?

WITNESS CASILLAS: Correct.

CHAIR KARLIN: And would that normally happen when you would have an unplanned transient?

WITNESS CASILLAS: No.

CHAIR KARLIN: No, so there is something different on an unplanned --

WITNESS CASILLAS: Correct. So that is very important aspect of performing a test. And, of course, then after -- once so -- so after the test is done then it is examined and determined for whatever purpose it was, and what the information tells us about the behavior of the plant for whatever, compared to previous history, or compared against a specific set point or behavior that one would be interested in.

CHAIR KARLIN: Okay, that is helpful. So when you -- but during the test itself there would be additional instrumentation, or adjustment to the way, would you increase the speed of your monitoring, or cameras, slow motion, or something?

WITNESS CASILLAS: When we talk about the specific, this specific test, the load rejection and the MSIV, there is no, as I said, we have, when plants start up we typically have what we call level 1 acceptance criteria, and level 2 acceptance criteria.

Level 1 acceptance criteria is basically the maximum pressure in the power response are as expected, or less than any bounding expectation. And that is very important.

Then the level 2 criteria has to do with other secondary parameters, and equipment response. And in there the criteria is that the response represents a reasonable response of the system.

There is not, really, a prescribed value, or something. But it is like, for example, the opening of the safety relief valves.

CHAIR KARLIN: So if I may, I understand, is the only difference, when you do a test, that you take a before picture, and an after picture?

Whereas when it is an unplanned incident all you have is the after picture?

WITNESS CASILLAS: Well, that was generally true in many, many years ago, because the data acquisition systems were limited. Plants, today, have acquisition systems that as soon as there is a disturbance, it starts taking data very accurately, and very close, several parameters.

And so what we have today, an unplanned events, is we have a wealth of information to be able to reconstruct the event. The only complication, in an unplanned event, is that you do not get a clean test, if you will. All the events something else initiates, and there is several things that are happening when the major disturbance is initiated.

So maybe there is a circulation system, there is a disturbance there that eventually causes an isolation. There is, maybe, a loss of vacuum that will trigger a turbine trip. And so there is a small complication.

And so those are, those make the analysis a little more involved of an unplanned event, compared to a planned event. A planned event is a clean --

ADMINISTRATIVE JUDGE RUBENSTEIN: Do you evaluate all the LERs of this transient, world-wide, on GE plants, do the owners groups, and stuff like this?

WITNESS CASILLAS: No, the practice on LERs is that any, if you will, interesting event that may occur in the industry is normally modeled and studied, and determined as to what it is.

Your typical two or three events that occur, throughout the fleet, every year, are examined as they are examined for LER purposes, that the peak values are no safety consequences, and all the systems respond as they are supposed to respond. That is the end of it.

ADMINISTRATIVE JUDGE RUBENSTEIN: You know, you qualified your answer to the last question. The value, and I don't want to put words in your, I want an answer.

What do you think the value of the test, is this predominantly dominated by initial startup of a plant, to see that the systems work? And you sort of -- I don't want to use the word dismissive. But you place lesser value on an operating plant where you have known the reactor control system response over a number of years, and the test value of the information may not be comparable to that of "the large transient test" in the startup phase of the reactor.

WITNESS CASILLAS: Well, what we know is

that from experience, and from history, is that the power level has a small, very small influence on this particular tests.

And so there is not a large change from what you see at 80 percent power, 90 percent power, or 100 percent power. It is a very predictable behavior. And so there is not, you know, power is not a big player in terms of severity.

The equipment performance and how you, what you credit and you do not credit in the event becomes an important --

ADMINISTRATIVE JUDGE RUBENSTEIN: This assumes that your maintenance inspection program says that the structures, systems, and components, are not affected by age, and that they will perform in a similar manner to when they were young in the startup phase? Is that how you assume this?

WITNESS CASILLAS: No, the history that we have of events throughout the fleet encompasses everybody. It is new plants, old plants, it is high power, it is low power, it is plants with higher capacity, with lower capacity, high power density, short vessels, large vessels.

I mean, it is -- we have all the parameters that could influence this test.

ADMINISTRATIVE JUDGE BARATTA: Could you explain, physically, why it is that the power level has a very small effect, I assume when you are referring to peak pressure, occurs? Could you explain that?

WITNESS CASILLAS: Well, the severity of the event is essentially the amount of energy that is being produced in the mitigation, and the performance of the mitigation systems.

Now, the shutting down of the reactor occurs the same way all the time. It is as soon as the valves start closing, as soon as the event starts the reactor shuts down.

So that the amount of power that is --

ADMINISTRATIVE JUDGE BARATTA: But the shutdown --

WITNESS CASILLAS: Not instantaneous, but the peak pressure, particularly, is an integrated response. And so even though it is not instantaneous, the thermal power response, the speed of the shutdown is so fast, we said it is less than three seconds.

And, in fact, all of this, these two events that we are talking about, we are talking about only 15, 25 seconds of duration. There is, really, not a lot of things happening in that time.

We have the closure of the valves, we have the shutdown signal of the reactor, and then we have the relief system. Now, in terms of power uprate you will have more energy in the system. We expect --

ADMINISTRATIVE JUDGE BARATTA: More or less 20 percent more energy?

WITNESS CASILLAS: It is, actually, it is actually more because you start with 20 percent and then you have a residual. However, all of that is balanced with your relief capacity. And so what we expect is that maybe another relief valve will have to open.

In some of the LERs you will see that depending on when the event occurred you had five relief valves that opened, maybe seven relief valves opened. And the increase in pressure will be slightly higher, which increases the relief capacity, as you know.

The higher, you just need to increase the system pressure during the event, slightly, and you have more blowdown in that control.

ADMINISTRATIVE JUDGE BARATTA: When you are trying, when the event occurred, are you referring to relative to core life, beginning at the middle, end of core life, is that --

WITNESS CASILLAS: Well, the core life only has an influence in the speed of the shutdown. Certainly through most of the core life the control rods are already inserted in the reactor.

And when the signal to shut down occurs it is less than two seconds, and the reactor shuts down. Now, at the end of life, where the safety analysis are performed, all the control rods are withdrawn, and they take the full three seconds to take in.

So there is a small effect on core life, but not --

ADMINISTRATIVE JUDGE BARATTA: What is it, when you made that statement, when it occurs --

WITNESS CASILLAS: When the test is performed, or when the analysis is performed, the conditions by which the event is being considered to occur.

ADMINISTRATIVE JUDGE BARATTA: Follow-up on -- I will get back to that.

ADMINISTRATIVE JUDGE RUBENSTEIN: TaKe your time. I'm very sanguine.

ADMINISTRATIVE JUDGE BARATTA: A follow-up on Judge Karlin's questions concerning additional instrumentation. The pressure pulse that occurs is fairly quick, in order of a few tenths of a second, at the most.

WITNESS CASILLAS: Well, there is two, there is the MSIV closure, that is slower. The stroke of the valve is from three to five seconds. And so that is a little slower.

The stroke of the turbine control valves, or the turbine stop valves, that is just over 100 milliseconds. And so that is really fast, correct, and the spike is very quick, right.

ADMINISTRATIVE JUDGE BARATTA: So one would not want to, for example, install any more responsive pressure cells, pressures on the tests would not want, maybe considerably accelerate beyond the current capabilities of the computer system, the data recording, or would not want to record, maybe, parameters, or information that is not normally recorded.

I mean, currently your system must have some limitation to help you plan parameters that can record how frequent --

WITNESS NICHOLS: Well, they are constantly thousands of them. We are down in the 30 millisecond range for capturing data with what is called the plant parameter display system.

WITNESS CASILLAS: Yes, the new systems

following the, some of the events that we've had in the industry, the data acquisition systems that now are very, very large. They take all inputs and they have filtered and unfiltered signals, and so there is not really, unless you were looking for a phenomena, they are just not instrumented, then there is no need for any more instrumentation.

Now, there is some of that done for steady state operation, various instrumentation done for EPU and for gathering more detailed information. But for the large transient tests, where we are looking at the performance of peak power and peak pressure and the behavior of the key mitigating systems, there is more than enough information for that.

ADMINISTRATIVE JUDGE BARATTA: I guess I'm very skeptical of your response. For example, let me ask a question. You currently monitor the actual valve position of the MSIVs?

WITNESS NICHOLS: Directly off those limits which you get those signals --

ADMINISTRATIVE JUDGE BARATTA: When it signals. But you don't know what the actual position is at millisecond by millisecond, do you?

WITNESS NICHOLS: No.

ADMINISTRATIVE JUDGE BARATTA: So you have no valve position indication. Wouldn't that be a valuable piece of information in the MSIV closure simulation?

WITNESS CASILLAS: Well, I'm not sure what instrumentation that VY has but certainly I have seen plants that have instrumentation on valve stroke distance, and we can see the position of the valve in some of the evaluations that we have performed.

So that information is available. But --

ADMINISTRATIVE JUDGE BARATTA: As an analyst wouldn't you want to have that information when you do a post-event simulation?

WITNESS CASILLAS: Well, depending on what you are after, again. If you are after what the -- what your peak pressure and power parameters are, and you have your initiating event and when the valve closes, why would you need any more?

A lot of the qualifications --

ADMINISTRATIVE JUDGE BARATTA: I still am very skeptical of your response, I'm sorry.

WITNESS CASILLAS: Let me try and amplify. A lot of the qualification studies of the ODYN Code, the benchmarking against the turbine trips will show a lot of interesting behavior throughout the event of different things contributing.

But when it comes to the peak power, to the peak pressure, that is essentially an integrated response of the system. And so you do not need to cut very close all of these other parameters to get a very good prediction.

And, in fact, that is why the uncertainty on the peak pressure prediction is not very large, even though there can be a lot of variation on small parts of the event.

ADMINISTRATIVE JUDGE BARATTA: I don't want to get into predictions at this point. But I would tend to disagree with you on that point, but it does seem to be a large deviation. Maybe it is not uncertainty from the predicted versus the actual on the results, anyway, that were in the testimony.

CHAIR KARLIN: I'm just trying to ground this, and what would you do if you were going to conduct an MSIV closure large transient test. And we are talking, I don't know if we are talking theoretically.

Have either of you actually conducted a large transient test MSIV closure, on any reactor, or any --

WITNESS NICHOLS: I have not.

WITNESS CASILLAS: There have not been

MSIV tests outside of plant startups that have been conducted by General Electric.

CHAIR KARLIN: So in the United States they have never been done outside of plant startups?

WITNESS CASILLAS: Outside of plant startups, that is correct.

CHAIR KARLIN: And when was the last one that was done, if you know?

WITNESS CASILLAS: Well, the last plant startups are events, reactors that started some four or five years ago.

CHAIR KARLIN: So these were advance --

WITNESS CASILLAS: Advance boiling water reactors.

CHAIR KARLIN: -- in the United States?

WITNESS CASILLAS: No, they are not in the United States.

CHAIR KARLIN: No, I mean in the United States.

WITNESS CASILLAS: No, in the United States the, I believe the last plants started up in the mid '80s. And so that is when --

CHAIR KARLIN: So 25 years ago?

WITNESS CASILLAS: Twenty-five years, correct. Controlled tests.

CHAIR KARLIN: And were you involved in any of those, personally?

WITNESS CASILLAS: No, I was not.

CHAIR KARLIN: So no one here has ever done a large transient test?

WITNESS CASILLAS: No.

CHAIR KARLIN: So it is a little bit theoretical when asking what would be done, what kind of tests would be done, monitoring instrumentation, what would you do? You have never done one, so it is a little harder to answer than if you had.

WITNESS CASILLAS: For that specific test, that is correct. We have, we run numerous plant tests, other tests of the plants in --

CHAIR KARLIN: Now, doesn't the SRP on this require large transient testing to be done for uprates, unless a justification can be made for an exception?

WITNESS CASILLAS: That is correct.

WITNESS NICHOLS: That is correct.

CHAIR KARLIN: And how many uprates, are there 11 or 12 you all testified to, 11, in the United States?

WITNESS CASILLAS: Several.

CHAIR KARLIN: And none of them have ever involved, no one has ever tested?

WITNESS CASILLAS: Yes.

WITNESS NICHOLS: To date no one has performed the test.

WITNESS CASILLAS: Yes, but the exception has been always given.

ADMINISTRATIVE JUDGE RUBENSTEIN: Why don't we move on, excuse me, let me consult with my colleagues.

(Pause.)

ADMINISTRATIVE JUDGE RUBENSTEIN: Analogous to the set of questions we went through, just immediately, now we know what the sense of where we are at, I think.

How about the load rejections from high power, do you want to at least describe that?

WITNESS NICHOLS: Describe the event?

ADMINISTRATIVE JUDGE RUBENSTEIN: Very briefly, don't go into subsystems, or auxiliary systems, just --

WITNESS NICHOLS: To be clear here, the one that is referred to here is the generator versus the turbine trip?

ADMINISTRATIVE JUDGE RUBENSTEIN: Yes.

WITNESS NICHOLS: They are just slightly

different in their initiation.

ADMINISTRATIVE JUDGE RUBENSTEIN: Right.

WITNESS NICHOLS: And the generator load reject is started, typically, considering an electrical fault, or some reason that the load on a generator goes away, a fault in the electrical system, etcetera.

What happens is in response to that the turbine control valves close, those close in approximately 100 millisecond, or a tenth of a second. Those are what initiate the reactor scram.

The turbine control valve fast closure energizes an acceleration relay which causes the scram. So that directly results in a reactor scram.

As those valves go shut we start to close off the path. But in this case we have installed, as all plants do, what are referred to as the turbine bypass valves.

So if the steam is not going through the turbine, but it is being generated, as these valves shut the bypass valves will go open. Vermont Yankee has ten bypass valves, in two banks.

And it actually has one of the highest bypass capacities in the United States. That is just a fact of original design. At power uprate, at our current power level, we have approximately 86 percent bypass capacity.

So what would happen is those valves would be opening as the reactor is shutting down, and then we would stay on those valves, and those valves would be used for pressure control.

So the difference between the power uprate condition, and the pre-power uprate condition, is at a given time instead of having two, or three, or five bypasses, it might be three, five, or seven. More of the bypass valves would be open at any particular time, because you have more decay steam.

ADMINISTRATIVE JUDGE RUBENSTEIN: Do you know of anyone, anywhere who has done the generator load rejection test without bypass?

WITNESS NICHOLS: I do not.

ADMINISTRATIVE JUDGE RUBENSTEIN: And do you know events where the bypass failed?

WITNESS CASILLAS: We have had, my recollection is that from the history of turbine trip and load rejections, we've only had partial bypass failure and slower than design bypass response, but never a complete failure of the bypass system.

ADMINISTRATIVE JUDGE RUBENSTEIN: So you wouldn't do a large transient test without bypass, that would be a major threat to the plant?

WITNESS NICHOLS: That is correct.

WITNESS CASILLAS: No.

ADMINISTRATIVE JUDGE RUBENSTEIN: Which of the three conditions would give you the largest and longest pressure pulse? I think you mentioned it before, but I want it clearly in the record.

WITNESS CASILLAS: The largest pressure from those would be the MSIV closure with secondary scram signal.

ADMINISTRATIVE JUDGE RUBENSTEIN: Do you want to add anything more about the sequence of events for the two transients under consideration? Either you or my colleagues. I'm ready to move on to another area.

CHAIR KARLIN: I have a question. On your testimony at answer 23, if you could refer to that, and this is something that Judge Rubenstein pointed out, you talked about generator load rejection from high power without bypass GLRWB turbine generator reload rejection, or generator load rejection.

So as I understand you are talking about without bypass. And yet, I guess, so that could be an event that would occur, a transient could occur, the generator load rejection without bypass, and is that true?

WITNESS NICHOLS: Although it could occur and as you see, that has never occurred. That is the design basis analysis, similar to the, in the MSIV case, where you analyze without the position scram, here to get the maximum effect you analyze without bypass, but in reality you would have the bypass.

CHAIR KARLIN: I see. So in effect it has never occurred.

WITNESS NICHOLS: Correct.

CHAIR KARLIN: But the tests, the large transient test does not occur without bypass?

WITNESS NICHOLS: It would not be done without, it would be done with bypass --

CHAIR KARLIN: Now, I assume, when we refer to SRP 14.2.1, the standard review plan, they have an attachment at the back. If I pull that exhibit out, which lists various tests that are to be performed, as I understand it, or could be performed, and this is one of them?

WITNESS NICHOLS: That is correct.

CHAIR KARLIN: Does this, does it say in that exhibit whether it is with or without bypass?

WITNESS NICHOLS: I don't have the reference in front of me, but to my recollection it does not specify without bypass, or MSIV closure with secondary scram.

Those are design conditions and analyses that are performed by design, they are not test conditions.

CHAIR KARLIN: So the SRP chart leaves some subjectivity or further interpretation to be left as to exactly how to do this test?

WITNESS NICHOLS: It is the practice. It is clear that it would not be done that way, because that is the design of the plant. You do not intentionally defeat design features of the plant to try to simulate some design, you know, worse case design analysis.

I mean, the test considers that the reactor is operating at 102 percent. We wouldn't go there for the purpose of starting the test. That is additional conservatism to generate the worse case result to show that you have margin.

ADMINISTRATIVE JUDGE BARATTA: On that point, though, what would happen, on the tests that have been done, for example for scram --

WITNESS CASILLAS: Yes, that was a very unique situation, and that is -- that is the only time that was done for the purpose of benchmarking models.

And it was --

ADMINISTRATIVE JUDGE BARATTA: What test was that?

WITNESS CASILLAS: Those were three consecutive turbine trip tests performed where the precision scram, so called the preemptive scram, was defeated. And so the secondary scram was used to shut down the reactor.

ADMINISTRATIVE JUDGE RUBENSTEIN: Well, I have a conclusionary question in this. Are any of the three transients a precursor to a major event, or have been shown to be?

WITNESS NICHOLS: Could I clarify what you mean by major event?

ADMINISTRATIVE JUDGE RUBENSTEIN: Lead to more significant damage. I don't want to use the terms of art.

WITNESS CASILLAS: It is a postulated question. Clearly if you, you know, if you postulate additional failures, continuing failures, then certainly you would get a --

ADMINISTRATIVE JUDGE RUBENSTEIN: You would have to go beyond the regulations. You would have to start assuming that certain systems failed, protective systems.

And then you would go into the reactor protection system, and then go to the safeguards systems.

ADMINISTRATIVE JUDGE BARATTA: So these could not lead to analogous, just by experience, a scram?

WITNESS CASILLAS: That would be a significant failure, the failure of the scram.

WITNESS NICHOLS: That is a different analysis, beyond design basis.

ADMINISTRATIVE JUDGE BARATTA: I'm confused, but I will let that slide by.

WITNESS CASILLAS: Well, please clarify.

ADMINISTRATIVE JUDGE RUBENSTEIN: I think, it was sort of an overall conclusionary question. I guess the other, I'm ready to go on to how Vermont Yankee and General Electric interpreted the requirements.

CHAIR KARLIN: Sure. If we can continue on this subject, still, for a moment. I wanted to get back to something that Judge Rubenstein was pursuing. And I think you gave him an answer I'm not sure I understood it, so maybe I will just ask again.

You were articulating that in the MSIV closure event there are two different types of MSIV closure events, one of them is with position scram, as I understand it, and the other is with flux scram. Is that the distinction?

WITNESS NICHOLS: Correct.

CHAIR KARLIN: And if I understood you to say the MSIV closure with flux scram was, that you would not use this, that particular version as a test, in testing?

WITNESS CASILLAS: Correct.

WITNESS NICHOLS: That is correct.

CHAIR KARLIN: And could you explain, again, why that is more strenuous, stressful on the system?

WITNESS NICHOLS: Well, because these are not choices. If the valves go shut the position scram occurs. That is a design feature of the system, which those are tech spec related switches required to operate at the tech spec systems.

So you would have to defeat that system in order to let the event transpire to the later scram.

WITNESS CASILLAS: I think that both events are the same, except that in the one event you have what we call a preemptive scram with the first signal that the system will receive, and to shut itself down.

In the second event, which is called the licensing and design basis event for purposes of demonstrating, analytically, that you will meet the maximum pressure and overpower criteria, for that event.

CHAIR KARLIN: And the licensing or design basis event is the closure flux scram?

WITNESS CASILLAS: Correct.

CHAIR KARLIN: Okay.

WITNESS CASILLAS: Correct, yes.

CHAIR KARLIN: That is what I thought you said.

WITNESS CASILLAS: So it becomes a very low probability event, but it is the licensing basis event. All the MSIV tests that have been performed, for plant startup have been the first kind.

CHAIR KARLIN: And is there a more stress put on the system in the second test, or is it the same?

WITNESS CASILLAS: No, it is higher.

CHAIR KARLIN: I'm sorry?

WITNESS CASILLAS: It is higher pressure, and higher power.

CHAIR KARLIN: So, therefore, is there more stress put on the system?

WITNESS CASILLAS: Correct, yes, significantly more.

CHAIR KARLIN: So the first one, the MSIV closure with position scram is a milder type of MSIV closure?

WITNESS CASILLAS: Something that is expected to happen every ten to twenty years.

CHAIR KARLIN: And this is the one that would be the subject of a test, if such a test were imposed?

WITNESS CASILLAS: Correct.

CHAIR KARLIN: And at some point we will get into, to discuss the stress and the risk imposed by doing these tests. And I'm not sure if this is the time.

WITNESS CASILLAS: This is a good time.

CHAIR KARLIN: To do that or not.

WITNESS CASILLAS: Well, let me --

CHAIR KARLIN: So if it is a relatively mild, MSIV closure with position scram, that is the one that would be used in a test, why not do it?

Setting aside financial, for the moment, which we will get to, let's talk about the risk, or the stress, or the burden that is imposed. It happens all the time, why not do it?

WITNESS CASILLAS: Let me just -- this is a good analogy of the car that you used. And, certainly, this is something that you would say, I want to drive, I have driven at 100 miles per hour, and I'm able to follow the car in front of me by 20 yards and I have experienced that I have to break, and I know that the 20 yards is enough to stop.

And so now you propose to drive 120 miles an hour and now you are told that you need 40 feet of margin to stop. And so is it worthwhile to run that test and break, impose that immediate break, and let the car slide 40 feet to see if it would stop in 40 feet?

And so it is not a particularly dangerous situation, but it is, but it is not something that I, when I go buy a car, I don't go and do that to verify that the DMV, that Motor Vehicles tells me that you must keep so many feet in distance, depending on the speed that you go.

So I'm not going to go and do that to my car. Now, I may have to do that and, in fact, it will happen every few years. I may have to brake like that, but I'm not going to go and try it out, because it is not common sense.

CHAIR KARLIN: Well, okay, that does

pursue my analogy. But if I were a race car driver, and I needed to know the limits of my vehicle because its safety was critically important, I might do such a test.

WITNESS CASILLAS: Yes.

CHAIR KARLIN: So let's turn to what would be, if you did run this test, what harm, what problem? You burn a little rubber on the tire and you learn how fast stop at one point. What, specifically, would wear out, or break or be a problem?

WITNESS CASILLAS: It is a question of where. And all the plants are designed for several occurrences of this type of an event. And so there is all these thermal cycles, it is the basis for the plant design that you will have so many of these events.

And so once you spend those events then you do not have that, you have used up, essentially, what you have.

CHAIR KARLIN: So you refer to an unnecessary transient cycle?

WITNESS CASILLAS: Correct.

CHAIR KARLIN: Unnecessary is something I guess that we will have to decide, it is for us to decide whether it is necessary.

WITNESS CASILLAS: Correct.

CHAIR KARLIN: But there is a transient cycle?

WITNESS CASILLAS: Correct, there is a transient cycle.

CHAIR KARLIN: Okay. I'm going to ask, tell me what -- a transient cycle is you have 100 of these in your bank and you use 50, and you don't want to use any more than you have to?

WITNESS CASILLAS: That is one aspect of that, yes.

ADMINISTRATIVE JUDGE BARATTA: I want to ask, do you know what the actual number is that this plant was designed for?

WITNESS CASILLAS: I do not know exactly the number.

ADMINISTRATIVE JUDGE BARATTA: Is it possible we could find that out?

WITNESS CASILLAS: Yes, we could find out. There is a design basis number.

ADMINISTRATIVE JUDGE BARATTA: Do you know how many such occurrences have actually occurred at this plant?

WITNESS CASILLAS: No. I can qualitatively comment that there were, that many cycles were projected and because the early experience of the industry is that there were many, many cycles. And so there is a considerable amount of cycles.

As plants, as the industry has evolved, there have been less cycles. And so in general plants use probably like half of their cycles.

ADMINISTRATIVE JUDGE BARATTA: Over their 20 year life?

WITNESS CASILLAS: Over the current. We never know what is going to, in fact that is one of the issues. We don't know what the future holds, and what are the conditions that these plants are going to be operated in the future.

But in the past, looking at the history of the plants, typically they use about half of what they were originally projected to use. So they do have -- but, you know, a lot of these events are not controlled by the utility, they are external to the utility. We do not know what the future --

ADMINISTRATIVE JUDGE RUBENSTEIN: Excuse me, is that -- when you talk about the number of transients in the plant over the life, that is sort of an ephemeral number in the sense that the plant itself, and the structures, and the components, aren't they subjected to inspection, maintenance, and replacement, and refurbishment?

So in that context I don't understand, quote, the apparent aging effect.

WITNESS CASILLAS: No, it is pretty straightforward. All of the components are subjected to thermal cycles. And every thermal cycle adds a duty to the components, and the design basis of these components they have a calculated duty.

They have calculated their duty to be 80 percent of their maximum lifetime to meet the criteria. And so every component has its duty calculated.

And that duty is based on the design basis. Now, as an example, often some of the cycles will be -- will exceed the defined cycle. We say in a shutdown you will shutdown at a rate of 50 degrees per hour.

Well, once in a while, because of circumstances, the plants will shut down at 75 percent, 75 degrees per hour. That represents higher duty than was originally designed for.

So then that duty needs to be factored back into the design basis of the plant and say, okay, you used up so much more. So it is not, there is a --

ADMINISTRATIVE JUDGE RUBENSTEIN: Excuse

me, can one really talk about the plant, per se, or does one talk about the design basis life of the vessel and then through inspection and maintenance follow that behavior, or on a given pump one talks about -- you are talking as if it were a standard and life never changed.

But these things are refurbished, they are rotated in and out of service, the main components are the steam -- even main steam lines are being replaced in plants now.

So I find your argument to be a little contradictory to what the reality is. Please address it in that way.

WITNESS CASILLAS: I think we are talking about two different things. There is always surveillance, and there is always inspection, and there is replacement of components, and there is this -- most of the components that will never be replaced, and that are subject to this thermal cycles, such as the vessel, such as the nozzles, such as core plate structures.

And so they will be per thermal cycles, and that is part of their design basis. And so that needs to be tracked. And, in fact, utilities track the cycles that their plant is subjected to.

ADMINISTRATIVE JUDGE RUBENSTEIN: Okay. I want to move on to -- you have more on this?

CHAIR KARLIN: Let me just back up.

ADMINISTRATIVE JUDGE RUBENSTEIN: On this subject I have a serious of questions. But do you want to stay on thermal cycles?

CHAIR KARLIN: I would like to just follow-up on the undesirable transient cycle phrase. As I understand it you contemplate that the plant has a certain number of transient cycles that are factored in at the beginning of the plant.

And then it experiences a number of transient cycles over its history. Now, you don't know what the number of transient cycles are set for Vermont Yankee?

WITNESS NICHOLS: Not off the top of my head.

CHAIR KARLIN: You don't know how many transient cycles they have actually experienced?

WITNESS CASILLAS: No, but the information is available.

CHAIR KARLIN: But you didn't provide it.

WITNESS CASILLAS: No.

CHAIR KARLIN: But you testified to us that this is an undesirable transient cycle.

WITNESS CASILLAS: Correct.

CHAIR KARLIN: Without knowing how many you've got, or how many you have experienced. Is this one out of a thousand, or one out of fifty, or one out of ten?

And is that the only cost associated with performing these large transient tests, that it is just another transient cycle? I mean, other than financial cost, is there any risk presented to safety?

WITNESS NICHOLS: To nuclear safety?

CHAIR KARLIN: Yes.

WITNESS CASILLAS: Well, there is always, it would be very minimal because it would be a controlled, and --

CHAIR KARLIN: So does it undermine the safety of the plant to do a test like this?

WITNESS CASILLAS: I would say no.

CHAIR KARLIN: Mr. Nichols?

WITNESS NICHOLS: Not in my professional opinion, it would meet the NRC safety goals. In other words, the risk to the public would be minimal. Minimally impacted.

ADMINISTRATIVE JUDGE RUBENSTEIN: I have a tidying up question on pressure. Starting at the safety limit PSIG 1250, one never approaches this because in series you have three steps which mitigate the effect of the peak pressure.

You have the SRVs, I don't want to testify for you. I want you to tell me, you have the SRVs, you have the screen loaded safety valves, and you have flow control. So you tell me how you eventually limit the pressure.

WITNESS CASILLAS: I don't follow. The design, the pressure for the design of the vessel is 1250. It is designed for, and the ASME code allows an upset value of ten percent higher, which is 1375. That is the requirement that we must demonstrate for the design basis event.

The real event, the event that occurs every several years, would not be expected to even reach 1250.

ADMINISTRATIVE JUDGE RUBENSTEIN: And what is the defense in depth that prevents it from reaching 1250, system wide, specifically? You have SRVs?

WITNESS NICHOLS: Well, it starts with, in the actual event, the position scram starts -- the position scram works, okay? So the two events, this is a milder transient to start with, okay?

Then we have both operator control of the SRVs, and automatic control, at staggered set point of those four SRVs. And then we have the three code safety, or spring safety valves that are on top of that, that provide that so-called over-pressure protection.

ADMINISTRATIVE JUDGE RUBENSTEIN: Which have limiting conditions of operation pressure settings?

WITNESS NICHOLS: That is correct, and those are swapped out every cycle, and tested. And I think we testified to the history of that.

ADMINISTRATIVE JUDGE RUBENSTEIN: So we now have a certain degree of defense in depth that says, regardless of the transient we are not going to get to 1250 PSIG because the flow control, the spring loaded safety valves, and the set points on the SRVs are set such that they will open and not allow you to get there?

WITNESS NICHOLS: That is correct. And the analysis --

ADMINISTRATIVE JUDGE RUBENSTEIN: -- define them for me.

WITNESS NICHOLS: The analysis takes those in. In fact the analysis done for Vermont Yankee credits one of the safety relief valves being out of service. The lowest set point safety relief valve is out of service in the analysis that is done for the design basis case.

So it is further conservatism. But what would happen is operators would cycle the safety relief valve, manually, if they were not able to maintain it with that, automatically the safety relief valves would lift.

If that was not able to do it, under the severe transient of the flux scram, MSIV closure, then safety valves may lift.

ADMINISTRATIVE JUDGE RUBENSTEIN: So in unplanned transients, where the operaTors responded, do you know offhand what kinds of pressures actually were seen?

WITNESS NICHOLS: What I do know, and I reference it in the exhibits, are the LERs from Vermont Yankee, and the one that occurred with the loss of offsite power in April of 1991, because of the loss of offsite power we lost the RPS motor generator sets, that resulted in an MSIV closure, it was not an MSIV closure event because the scram had occurred.

But it was probably as close as we would come to that. And in that particular case the operators controlled pressure by just opening one safety relief valve.

ADMINISTRATIVE JUDGE RUBENSTEIN: And it controlled pressure to?

WITNESS NICHOLS: They would have -controlled it, the normal instruction would have been to set a band, 1000 pounds to 800 pounds. They would have --

ADMINISTRATIVE JUDGE RUBENSTEIN: So they controlled pressure to the normal level?

WITNESS NICHOLS: That is correct.

ADMINISTRATIVE JUDGE RUBENSTEIN: So that is the first line of defense and then you have a couple more lines of defense?

WITNESS NICHOLS: Right. And then, as I said, they would go on to HPCI, or something like that, to give you the --

ADMINISTRATIVE JUDGE RUBENSTEIN: Compressive load?

WITNESS NICHOLS: Right.

ADMINISTRATIVE JUDGE RUBENSTEIN: Now, kick up the water level and knock the void fraction down?

WITNESS NICHOLS: Correct.

CHAIR KARLIN: All right, we are going to try to take a lunch break at this time. The witnesses have done yeoman services for an hour and a half, or something. So we will take a break.

We would like to keep this moving relatively quickly. Therefore let's reconvene at 1:15, one hour. Because there are proprietary documents in the room, once we are adjourned please everyone leave the room, and we have guards here who will protect it. Thank you. Good point.

All right, we are adjourned.

(Whereupon, at 12:15 the above-entitled matter was adjourned for lunch.)

A-F-T-E-R-N-O-O-N S-E-S-S-I-O-N

1:20 p.m.

CHAIR KARLIN: Good afternoon. We are now reconvening, the Atomic Safety and Licensing Board. I want to remind the witnesses, Mr. Nichols and Mr. Casillas, that you are still under oath. So we wanted to proceed with questions that we might have relating to your testimony.

I had a question or two related to the costs associated with doing the MSIV test, and the generator load rejection test. And I would break it down, perhaps, and I think as your initial statement of position has stated, there are costs associated, financial costs.

I want to break it into two areas that I want to ask you questions about, if I may. One of them is what are the costs associated with doing the test, i.e., additional staff, additional work, additional consultants, that you have to affirmatively incur when you would do such a large transient test?

And the other category is, what are the costs in the nature of lost revenue? So if we could focus in that way?

Could you tell me, I guess Mr. Nichols, let me start with you. Do you have a -- back it up.

Have you indicated to the Staff, in this proceeding, what the costs, both loss of revenue, and affirmative costs would be in doing these tests?

WITNESS NICHOLS: We have not made any explicit statement in a dollar value of additional staff cost, or lost revenue cost for such a test.

CHAIR KARLIN: When you say explicit statement you haven't had a specific dollar value, but you have mentioned to them there would be these costs?

WITNESS NICHOLS: That is correct. In our application we talked that there are costs of doing the test but have not said it would be a minimum of 48 hours of lost revenue, or something like that.

CHAIR KARLIN: Right, okay. And when we are talking about costs I want to exclude cost in the sense of safety, or stress related costs on the system. I'm talking about dollar costs.

WITNESS NICHOLS: I understand.

CHAIR KARLIN: We've already covered, I think earlier this morning, the other type of costs. Okay, so it has been discussed with the Staff but not specific dollar figures?

WITNESS NICHOLS: No.

CHAIR KARLIN: And can you give me an estimate of the costs that would be entailed, i.e., the affirmative costs you have to spend to do an MSIV closure test?

WITNESS NICHOLS: As we discussed this morning we have neither prepared for one, because at the present time we have the exemption, and I have never managed that type of test.

But our estimate, and to detail what would be involved, we would certainly, for a planned evolution have additional people on the staff, as opposed to bringing them in following an event. But we would have those people there to real time be able to both asses what has gone on for the test and to rapidly turn around the plant event.

So that would be that additional, most likely it would be mostly internal labor cost. Our engineers that monitor, additional operators to deal with the effects, additional consultants such as GE, or others, would have to be contracted to do analyses of the results.

CHAIR KARLIN: Has Entergy done any estimate of what these costs would be?

WITNESS NICHOLS: We have done no financial estimate of what those costs would be.

CHAIR KARLIN: Do you have an estimate of what they would be? And I don't want you just to guess.

WITNESS NICHOLS: Right. And I don't. It would be, probably, it would be in the range of 20 to 30 personnel put on shift, or whatever, to respond to it from staff. But the cost of an analysis done by someone I don't have that.

CHAIR KARLIN: Okay. Turning to the other, well Mr. Casillas, do you have anything to add on that?

WITNESS CASILLAS: No, I have nothing to add to the cost of running the test.

CHAIR KARLIN: Okay. Then turning to --

ADMINISTRATIVE JUDGE BARATTA: In order to run the test you would obviously have to spend time preparing the appropriate documentation. You mentioned the cost of analyzing the results. You mentioned an estimate of how many people you might need on staff to be able to do, to physically do the test.

Do you have any idea of how many people, and for how long it would take to prepare the test procedure?

WITNESS NICHOLS: I do have a related experience in that. At the conclusion of the power ascension testing, under a license condition from the

NRC, we ran an integrated test of a similar nature called the condensate pump trip test.

Where at full power we tripped a condensate pump and it initiated a trip of a feed pump followed by a reactor -- a very integrated test. And I had staff people that wrote that report, that procedure that you referred to, to how to do the test.

And that was lengthy, it took a couple of engineers several weeks to write that. So it is not in the term of man hours, it is in the term of man weeks to get all of those precautions and criteria set into a procedure.

Similar nature was run and then we, again, had the people there to analyze it. We used internal resources to do follow-up analysis, and submit reports to the NRC.

ADMINISTRATIVE JUDGE BARATTA: Do you have any estimate of what that cost was?

WITNESS NICHOLS: If I were to estimate --

ADMINISTRATIVE JUDGE BARATTA: If you don't feel comfortable --

WITNESS NICHOLS: No, it would be -- the preparation procedure I would estimate at about 25,000 dollars to prepare.

CHAIR KARLIN: And then turning to the

other component, it would be the lost revenues associated with doing the MSIV closure test. And/or, let's say the generator load rejection test, lost revenues.

WITNESS NICHOLS: And the way we would look at that is what is the absolute minimum turnaround time, okay? Because it results in the plant, obviously, going offline. And I can speak to the complications of that.

But if we start with the absolute minimum we would be offline for 48 hours, and then come back online. So that is, you know, a significant amount of lost generation in the State of Vermont, and cost to both the rate payers and Vermont Yankee, Entergy.

As evidenced by the Licensee Event Reports, from unplanned events, it is most often not that simple in that there are complicating features. So it is rare, although we have timed that event, we have a schedule prepared for such a thing, to turn it around within those 48 hours, it is often three, four, five days, were we to have such a complication of a generator bearing, or a turbine bearing problem, now you turn into a week's repair, etcetera, added on there.

And those are the complications that have absolutely no safety impact. But in any cycle of the plant things can happen, and that we have to go address. And those are well documented in those Licensee Event Reports.

CHAIR KARLIN: And convert that to dollars for me.

WITNESS NICHOLS: Being offline for the two day minimum would be close to a million and a half in revenue.

CHAIR KARLIN: In revenue, a million and a half for two days total?

WITNESS NICHOLS: For the minimum period.

CHAIR KARLIN: Okay. Any questions?

ADMINISTRATIVE JUDGE BARATTA: Thank you. A couple of things in your testimony. Getting back to, again, talking about the transient. First off, one point before I go to your testimony.

Could you provide us with a timing and sequence of events? I know you gave us kind of a general description of a transient, really getting down to the point of, okay, the valve takes so many seconds to start to close and reach the ten percent stroke point.

Then it takes so many seconds for the rods to move into the core, based on typical conditions.

The peak pressure would be reached, then, at such and such time, the main steam flow would stop at such and such time, etcetera.

And HPCI would come on all the way down until, essentially, the plant is more or less at a stable condition. It doesn't have to be to the point it is cooled down, but the usual type of timing and sequence event you see in the description of the transient, for both the MSIV closure, as well as for the turbine trip.

And the part I'm concerned, I'm primarily interested in an MSIV closure, not the high flux scram, but the valve position scram, okay? Just so we have that in mind on that.

WITNESS CASILLAS: Is that your question?

ADMINISTRATIVE JUDGE BARATTA: Yes, that is my question. I don't expect them to come up with instantaneous, okay? It is going to take them a little bit to dive down. But it may be --

CHAIR KARLIN: Maybe we could ask them, what is the first thing that happens, how long does it take? Okay, what happens next, how long does it take, what happens next, how long does it take?

ADMINISTRATIVE JUDGE BARATTA: I mean, are you prepared to answer that now?

WITNESS CASILLAS: I will try and answer the, and you want both events, MSIV and load rejection?

ADMINISTRATIVE JUDGE BARATTA: One at a time.

WITNESS CASILLAS: The MSIV first, you would initiate the closure, as we said, it will close anywhere between all valves will close between, as fast as three seconds, as slow as five seconds.

So in that range probably average four seconds they will all close. And almost immediately, as the movement of the valve goes, there will be a signal sent to the reactor protection system for the scram.

And the rods will start moving approximately 200 milliseconds into the event. So, and they will complete full insertion in less, in approximately three seconds, or so.

So before the valves are fully closed the rods have done a significant control. The typical situation is that the power will start decreasing significantly, the instantaneous flux will start decreasing to a very low level by the time the MSIV close sufficiently to cause a rise in the pressure at the reactor.

That, in turn, will collapse the voids and cause a flux increase. And in the transient we expect to see a small flux increase at a very small level, at less than later on in the area of about when the valve is fully shut, so about four to five seconds.

The pressure will rise as we said. I think one detail is that the steam lines have flow limiters to limit in case of a steam line break, to limit the amount of flow that is discharged.

And, really, there is no, so long as the valves do not exceed that flow limiter, there will be no disturbance. So, really, you will not see any pressure disturbance until the tail end, maybe the last 30 percent, or so, of the closure of the valves.

So nothing happens for a long time. And by the time it happens, it happens very quickly at the end. And so the pressure will rise at the end of the valve closure, and in about one second after the initiation of the pressure rise, the relief valves will open.

And by two seconds after that the peak pressure will be reached in the valve, and the pressure will be decreasing. So the peak pressure would occur in around eight seconds, less than ten seconds, for sure.

And then the pressure would decrease, the valves would reclose, and either a manual operator will control the pressure with a single valve, or the automatic system will control the valve.

And the reactor core isolation system will start up and control the water level.

ADMINISTRATIVE JUDGE RUBENSTEIN: Without giving me an analytical answer, if the pressure peaks at a given time, when does it start to build up?

WITNESS CASILLAS: To build up? I said at the tail end of the closure of the valve. So the valves will close four seconds. So I would say about three and a half seconds the pressure will suddenly rise very quickly.

ADMINISTRATIVE JUDGE RUBENSTEIN: Before the buildup it would be between four and eight seconds when it reaches its peak.

WITNESS CASILLAS: But it will be --

ADMINISTRATIVE JUDGE RUBENSTEIN: How fast does it attenuate?

WITNESS CASILLAS: How fast does it turn around?

ADMINISTRATIVE JUDGE RUBENSTEIN: Does the wave decay?

WITNESS CASILLAS: Yes, as I said, the --

ADMINISTRATIVE JUDGE RUBENSTEIN: Are you giving me a code answer, or is this from measurement, or experience? I'm trying to -- I don't want to get into the code yet.

WITNESS CASILLAS: Well, we have seen many of these events, and we have calculated many of these events. So I'm familiar with the behavior, and I can tell you for sure what I'm speaking on. But this is the way the event progresses and behaves.

ADMINISTRATIVE JUDGE RUBENSTEIN: As determined through physical measurements, primarily?

WITNESS CASILLAS: Right.

ADMINISTRATIVE JUDGE RUBENSTEIN: That is what I'm after.

WITNESS CASILLAS: And so the extent of the pressure pulse it is, as we said, it will peak around eight seconds, maybe as much as ten seconds, depending on how the valves, how the relief valves are staggered.

And then as soon as the sufficient capacity is available, then the pressure will decrease rather fast until the valves close. And so we are talking about another eight to ten seconds. So the whole pulse, if you will, will be less than 30 seconds, anywhere between 20 and 30 seconds.

ADMINISTRATIVE JUDGE RUBENSTEIN: And if you started at four, and you start to build up at eight, and attenuate maybe ten seconds, so the area under the curve, the 90 percent of the area under the curve takes place in six or eight seconds?

WITNESS CASILLAS: You mean the maximum? The time when the pressure starts increasing would be anywhere between three and four seconds. And it will reach the peak in about eight seconds, maybe ten seconds.

And then it will come back down to less than the initial value in another ten seconds or so.

ADMINISTRATIVE JUDGE RUBENSTEIN: Okay, so about 23 seconds is the most of the area --

WITNESS CASILLAS: Correct, that is the pulse.

ADMINISTRATIVE JUDGE BARATTA: The one thing that you didn't mention, and I'm probably going to ask the question accordingly, you also get a commensurate drop in water level due to the collapse of the voids?

WITNESS CASILLAS: That is correct.

ADMINISTRATIVE JUDGE BARATTA: When does that occur?

WITNESS CASILLAS: Well, the void collapse will be commensurate with the pressure. So as soon as the pressure starts increasing the level will start decreasing, and the voids in the core will decrease.

ADMINISTRATIVE JUDGE BARATTA: And the feed system doesn't catch up with that right away?

WITNESS CASILLAS: Yes, it will. We will have a fast drop, initial drop. And depending on the specific reactor conditions, that drop may be sufficient to trigger some makeup systems or, often, it will not trigger them, and then it will wait until you have more cycles to come on.

Now, once you isolate them then your feed system is not active any more. So you have to bring the reactor ICRC to come to control level.

ADMINISTRATIVE JUDGE BARATTA: So assuming you don't have one of the trip points for one of the other systems coming on, the low water level during this initial phase will probably hit about the same time as the pressure, is that correct?

WITNESS CASILLAS: Some plants will do that. I believe VY does not initiate the RCIC automatically. The level collapse is not as large.

ADMINISTRATIVE JUDGE BARATTA: And that collapse would occur, more or less at the peak pressure, would be the lowest points?

WITNESS CASILLAS: Yes, right. But then it would continue to decrease because you have no makeup. And so, for sure, you will initiate the makeup system eventually. Either immediately or later on.

ADMINISTRATIVE JUDGE BARATTA: And in terms of the top of active fuel would the level, assuming the other systems work normally, we are not talking about multiple failures, but the top of active fuel ever be reached?

WITNESS CASILLAS: Never. That is a safety limit, it is not reached. This event is not the most challenging for a level.

ADMINISTRATIVE JUDGE BARATTA: I'm just trying to clarify all the --

WITNESS CASILLAS: Yes, no, not even close.

ADMINISTRATIVE JUDGE BARATTA: Okay. And can you do the same for the turbine trip?

WITNESS CASILLAS: Yes. The turbine trip essentially initiates either by closing the stop valves. We have four stop valves, one on each steam line. And they will close.

They are required to close, they are analyzed to close as fast as 100 milliseconds.

Typically they will close slower than that. So anywhere between 100 and 200 milliseconds is what the closure will occur.

And at that time we will have a preemptive scram signal to the reactor, and to initiate the control rods insertion. And the control rods insertion will initiate maybe at about 200 milliseconds.

And it would be complete, again, in about three seconds. However, because of the speed of the valves, that close so fast, we will have, we will get pressure wave into the reactor, traveling into the reactor, and a pressurization, before the control rods actually are significantly inserted.

However, at the same time that the control valves, or stop valves are closing, the bypass valves will open almost with the same speed. They have a fast opening. And so they will open fast, and their steam flow will be directed there.

So the magnitude of the wave, of the pressure wave into the reactor, will be the difference between the steam that goes into the condenser, and what was being produced by the vessel.

In the case of VY the previous power, the bypass valves admit all of the steam. So the pressure pulse into the reactor was pretty minor. In the EPU case you have a small, you have about something about a little over ten percent, twelve percent excess steam.

So you will have a more of a pressure pulse going into the reactor. And so that will, that causes a pressure rise and a power rise in their reactor, until the control rods fully insert.

Depending on the amount of power that you produce you may or may not open a relief valve. If the thermal power is turned around fast enough, then the 87, 86 or 87 percent capacity of the bypass will take all of the steam and you may see just a very small pressure rise in the vessel.

If the shutdown rate, the control rods coming in, is sufficiently slow, then you may open one relief valve and that may be more than enough to take the extra steam.

And then as soon as the power continues to decrease, then pressure will decrease, and pressure will be controlled by the bypass system.

ADMINISTRATIVE JUDGE RUBENSTEIN: Just verbally compare the two profiles of the pressure between the two transients we just discussed. In magnitude, frequency, shape, whatever you think is germane.

WITNESS CASILLAS: Well, in terms of its --

ADMINISTRATIVE JUDGE RUBENSTEIN: Peak.

CHAIR KARLIN: Well, in terms of its peak clearly the MSIV closure will have a larger peak because it has no bypass.

ADMINISTRATIVE JUDGE RUBENSTEIN: Yes, but we are talking about the other. So you would say this is smaller than the MSIV?

WITNESS CASILLAS: Well, the MSIV will open the relief valves and --

ADMINISTRATIVE JUDGE RUBENSTEIN: You don't have to justify it, just describe the two profiles.

WITNESS CASILLAS: If you will, the time history, in terms of duration, is comparable for both of them, because they both have the same time constant, if you will. They are all caused by the integrated energy being generated.

So they both, and they are both controlled by the relief valves. So they have the same history. In terms of, that we discussed, less than 20 seconds, or approximately 20 seconds.

The peak, however, of the MSIV is larger because it doesn't have the bypass, and --

ADMINISTRATIVE JUDGE RUBENSTEIN: And it is observed?

WITNESS CASILLAS: Yes.

ADMINISTRATIVE JUDGE RUBENSTEIN: Thank you.

ADMINISTRATIVE JUDGE BARATTA: So your peak pressure, then, will occur at approximately what time?

WITNESS CASILLAS: It would be less than ten seconds, approximately eight. The case of the MSIV would be approximately eight. The case of the load rejection, it is probably five seconds, because the pressure rise started like three seconds earlier, because of the fast closure.

So you just move evetryyhing, move it closer for the load rejection, because the valve closes almost immediately. So typically five seconds for the load rejection.

ADMINISTRATIVE JUDGE BARATTA: And the -- you said depending upon when the rods, that is primarily determined, in other words how far the rods are in, to begin with?

WITNESS CASILLAS: Yes, that would be one determinate. What is the --

ADMINISTRATIVE JUDGE BARATTA: Would that be the dominant one?

WITNESS CASILLAS: Yes, for the case of the load rejection, where the pressure reaches the core before the control rods do a significant insertion, then that would be dependent on the core characteristics, whether you have early life, late life, whether you have a power distribution that has peaked on the bottom, peaked on the top of the core.

ADMINISTRATIVE JUDGE BARATTA: There is a statement here, I'm looking at question number 27, and I think Mr. Nichols, I think this is your response. It says that it is important to note that the EPU transient, it is on page 11, I'm sorry.

WITNESS NICHOLS: Thank you.

ADMINISTRATIVE JUDGE BARATTA: EPU transient analysis at Vermont Yankee were performed assuming operational integrations that are impractical to replicate during a testing program, and are unlikely to be seen during actual plant operations and, therefore bound, i.e., represent more severe conditions.

And I think you can give us some explanation as to why that would be. The transients that would occur during actual plant operations, or during large transient testing.

And my question, really, is with respect to that statement. Would a large transient test, if you were to be required to perform, would that be -- would there be an attempt to make it somewhat bounding? Within, of course, the tech specs and everything else.

WITNESS NICHOLS: No, we would run the tests by initiating the actual signal. For example, for the generator load reject we would initiate a closure of the control valve, okay?

And we would not defeat any bypass valves, or things like that. So most of those conservatisms are on top of the test, or the actual events. So what we would see is the test and actual event, minus any failures, would be very similar.

And the design analysis event would be far away.

ADMINISTRATIVE JUDGE BARATTA: Just to give us comparison. So it would be closest, if not the same as an operational event?

WITNESS NICHOLS: That is correct.

ADMINISTRATIVE JUDGE BARATTA: As opposed to a bounding analysis type of event, is that what you are saying?

WITNESS NICHOLS: That is absolutely correct.

ADMINISTRATIVE JUDGE RUBENSTEIN: This would be a sort of electrical signal for turbine's initiation?

WITNESS NICHOLS: Correct, we would not put a fault on the generator to do that.

ADMINISTRATIVE JUDGE RUBENSTEIN: So you would just change the logic and --

WITNESS NICHOLS: We would inject the signal somewhere.

ADMINISTRATIVE JUDGE RUBENSTEIN: Okay.

ADMINISTRATIVE JUDGE BARATTA: I think the remainder of my questions, really, pertain to a later phase of the discussions. I think we can go on now.

ADMINISTRATIVE JUDGE RUBENSTEIN: Having gotten the easier stuff over, let's move on.

CHAIR KARLIN: I'm not sure. Let me just pursue that question. I'm sorry, if you would bear with me?

So let's focus on your answer 27, again. You are saying wouldn't confirm any new significant aspect not routinely demonstrated by component level testing analyses impractical to replicate, and therefore bound the situation.

Now, your attachment, table 1 to your testimony, lists equipment modifications implemented for EPU, right?

WITNESS NICHOLS: That is correct.

CHAIR KARLIN: And it is dozens, and dozens of equipment modifications for EPU, right?

WITNESS NICHOLS: That is correct.

CHAIR KARLIN: Is this what they call a major modification when you have a 20 percent uprate in power?

WITNESS NICHOLS: It is a significant modification to the plant. But these 20 or so odd listed here are not, don't represent a huge bulk of the overall plant itself. It is significant to the plant.

CHAIR KARLIN: And the plant is a complex system and you have just added, or made 20 modifications to it?

WITNESS NICHOLS: That is correct.

CHAIR KARLIN: And you are increasing its power. So, I mean, how do you know that the past bounds the future when you have made this major modification and 20 different changes to the system?

I mean, isn't there a system wide how does it all work together under these different conditions, and with different equipment, and that sort of thing, that is tested when you do the test?

WITNESS NICHOLS: And that is exactly what the regulation requires, and what we provided in our exemption request to the Staff, is to go through those modifications.

For example, one of the very first ones is the new high pressure turbine. Well, it was this big, and now it is a little bigger to get more steam. So in that respect it has no impact, and we looked at them that way, okay?

Modifications done in the switchyard for improved stability control in the switchyard, don't relate to this. And we go through each of them and look at that.

And, in fact, so that is where we came to the conclusion that we did not add new systems. We didn't add some new makeup system that would intervene between the safety relief valves and the safety valves, okay?

We did not make a pressure change. That meant there would be no effect on the HPCI or RCIC system. So all those things together, looking at each individual modification, and its impact on either the plant response, integrated or individually, was not a big change.

In fact the test I mentioned earlier, the condensate pump trip test, was where we provided a new feature, as I explained during the tour, that we now run three feedwater pumps, and that is a new feature in that when before power uprate two would be running.

If one were to trip the other would start, and we would stay at one hundred percent power. Under power uprate conditions, where we are today, if one of those pumps trips, or one of the pumps feeding them, the condensate pump trips, then we have to reduce power rapidly, initiating what is called a recirc run back.

The Staff saw enough change in that particular system interaction to require us to perform a test of that, which is the test I referred to. They agreed with that assessment, basically, in table 1. When looking at the whole of them, and the response to these particular transients, that they were not significant.

CHAIR KARLIN: And, just for the record, we are referring to Entergy exhibit number 39. So my analogy earlier, a simplistic way of thinking about it, I mean you have a race car, a highly developed, very highly engineered race car, and the team decides they want to make it go better, and do better, and so they initiate 20 modifications to the race car.

Maybe a little difference in suspension, a little difference in the engine, a little difference in the tuning, a lot of different things. And they figure they increase the engine by 20 percent and they say we don't need to go out in the racetrack and try it because we can just know that all these things are going to work fine together.

And we don't need to do it before the big race, we will just assume that it works.

WITNESS NICHOLS: Actually I don't like your analogy, and I didn't like the earlier one.

CHAIR KARLIN: No, explain to me how that is wrong, because that is very simplistic --

WITNESS NICHOLS: If you go to the earlier analogy, about the car stopping, that we talked about, and there is a wall at 65 feet ahead, and I'm at 100 miles an hour, and I know I can stop in 65 feet, okay? Or that is what I have to do is stop at 76 feet, because that is the margin, okay, the requirement.

At 120 miles an hour I can stop that car per my benchmarked analysis. I've got my analysis that is done, looking at all the changes I have made, to that car, in addition to going 120, your new windshield, your whatever.

CHAIR KARLIN: Right.

WITNESS NICHOLS: And some of the -- I'm not trying to be coy, but some of the modifications are like a new windshield, they have no impact. Some are suspension, how it will react.

In that case it is determined, analytically, in a benchmark analysis, back and forth, being the ODYN analysis, that it can stop in 85 feet. In reality the wall is 200 feet away, because that is the margin, the code limit, the whatever, okay, the safety analysis limit.

So we are talking down in here and comparing at those relative ranges, and just a figure of speech, let's say it is 200 feet, but there is additional margin beyond that.

CHAIR KARLIN: Right. And one of the factors for consideration is that the margin of safety that is built in and how much of the margin is consumed. Is that not correct, in the SRP?

WITNESS NICHOLS: Well if you set the limits at 85 to maintain the safety margin.

CHAIR KARLIN: Okay, we will get to that later. All right, thank you.

ADMINISTRATIVE JUDGE RUBENSTEIN: May I

start? WE are going to go on to requirements as the SRP 14.2.1, and review standard 001. And luckily for you the brunt of these questions will fall upon the Staff.

However, looking at your responsibility, what were the factors, within the requirements? Would you list the factors and then start to tell us how you satisfied them?

WITNESS NICHOLS: What are the factors that we felt were important?

ADMINISTRATIVE JUDGE RUBENSTEIN: That were in the regulatory requirements as explained in the SRP which you tried to satisfy, even though it is Staff Guidance for review, there are a number of factors that say these are the requirements for a waiver.

So state the requirements and say how you satisfied them.

WITNESS NICHOLS: In order to respond to you I would like to refer to the SRP if I may. That is one of our exhibits.

ADMINISTRATIVE JUDGE RUBENSTEIN: And we can stipulate that the regulation is what was described before, appendix B to Part 50 paragraph 11. That is the underlying requirement.

(Pause.)

ADMINISTRATIVE JUDGE RUBENSTEIN: You can be relatively brief because a lot of it is in the testimony. But, also, give me a sense of which ones you think are most important and how you would weigh them.

WITNESS NICHOLS: I'm presently referring to Entergy exhibit number 4, which is SRP14.2.1, page 7 of that, the section C. And that has the seven criteria that are evaluated.

And they include such things as analysis performed, operating experience, both at your plant and other plants, any changes to thermohydraulic phenomena, etcetera. And they are listed there.

So we looked at those, specifically. The one that we paid the least amount to was risk implications, which is G, the last one. And that was just a determination to keep it more of a straightforward, and not try to impose a risk argument.

Because that is not a PRA risk argument. So the ones that we looked at, we started with the guidance in the vendor topical report, which is the CPPU LTR, or the CLTR, which is the GE topical report for the constant pressure power uprate.

It talks to some of the criteria for the analyses that are done. We then looked at the analysis and the change in analysis that was done by GE, the ODYN work, and what has changed in that.

In other words, what did the modifications do as we refer to exhibit 39, and the changes caused by the modifications we made. There was no pressure change, there was no, etcetera. So we looked at it that way.

And then in looking at that we then went on to the operating experience. Vermont Yankee, at the time, did not have operating experience at extended power uprate conditions, obviously, but as we explained earlier, the power level difference was not an overriding factor. It is what is the change in the plant.

Well, since we were able to determine that since there is no pressure change, and the components are relatively the same, other than the slight modifications to them, not whole system modification, that the performance of the plant at uprate would be similar to its performance at original license thermal power.

We then referred to the, at the time we made the applications to the Staff, we referred to the three events from 1991, in our testimony here, since there has been an event in 2004 and an event in 2005, we added those comparisons.

But because we looked back at the changes since 1991 and said the plant has not been significantly modified in its operation, in looking at ODYN, how it would respond to such transient, we made that conclusion.

We then went out and compared the operation at other facilities, the two -- the three are Hatch, Dresden, and Brunswick, all of which have implemented at least 15 percent uprates, and had events operationally at those values.

And that provided further confirmation that what happened at uprate conditions was not significantly different than what happened before they got their uprates. All that, combined with the analysis done by GE, was our justification.

ADMINISTRATIVE JUDGE RUBENSTEIN: Before we get into details of ODYN and the experimental information, I want to -- the original basis for the Contention was a number of four, I believe, from Mr. Gunderson, and three of which were introduced by the more recent testimony of NEC which primarily focused, to a larger degree, on ODYN and experimental information, which you just alluded to.

However, one of the areas which was not thoroughly explored, even in subsequent testimony of NEC, or the Staff, but is still sitting on the table, I want to explore a series of questions on thermohydraulic phenomena, and systems interaction.

So in dealing with that question I think I was going to ask you how long Vermont Yankee had been operating at CPPU conditions, but Mr. Travieso-Diaz was kind enough to say already, in his preamble, that was six months.

I assume direct measurements, were direct measurements of temperature, flow, and flux, made and analyzed during the period of your recent extended power operation?

WITNESS NICHOLS: Of normal occurrences of events?

ADMINISTRATIVE JUDGE RUBENSTEIN: Do you have that data? You have -- what is your power distribution monitoring capability, TIPS?

WITNESS NICHOLS: That is correct.

ADMINISTRATIVE JUDGE RUBENSTEIN: SRMs, source range monitors, LPRMs, low power range monitors, and are you able to fully map the core steady state and during the transient, in terms of power distribution, shapes of curves?

WITNESS NICHOLS: Yes, the --

ADMINISTRATIVE JUDGE RUBENSTEIN: And the question then becomes were there any observable changes at steady state in power distribution, which would indicate, either through chugging, void fraction, unanticipated void fraction distributions, power distributions, perturbations in the radial and axial shaped curves at that period in life, was anything observed?

CHAIR KARLIN: Can I ask you, what is the question? I don't understand the question.

ADMINISTRATIVE JUDGE RUBENSTEIN: I'm asking you, we are talking about thermohydraulics.

WITNESS NICHOLS: Right.

ADMINISTRATIVE JUDGE RUBENSTEIN: And --

CHAIR KARLIN: It is just a long question and I just wanted to ask you to ask it so that I could understand it. It was a long question.

ADMINISTRATIVE JUDGE RUBENSTEIN: One defines the characteristic of the core with a series of flux, flow, and temperature measurements. And these mirror the void fraction, and the moderated density, and other things which would be affected by thermohydraulic considerations.

Have you seen any aberrational performance?

WITNESS CASILLAS: No. We would not expect -- we haven't seen anything, and we wouldn't expect to see anything. The methods that we used to predict the characteristics of the core have been fully approved for all the range of conditions that VY will experience.

And that may seem like a strange statement, but in understanding the conditions that the plant operates, I think it is fairly easy to explain this. When VY is operating at their previous power level, they had a window of core flow, whereby they could exercise their rated power.

So the core flow can have a range. As they increase power to 20 percent that range is decreased. But it is decreased while preserving constant void fraction. So you will not see, you will see higher velocities, but you will not see any different properties that are important for the physics.

So --

ADMINISTRATIVE JUDGE RUBENSTEIN: You are giving me an answer, and the contention was that these could occur. And the question was, did you see any, in actual fact? And I think you gave me an answer.

WITNESS CASILLAS: No.

ADMINISTRATIVE JUDGE RUBENSTEIN: Okay. Were any safety limiters, minimal critical power ratios violated during this course, at a high power?

WITNESS CASILLAS: No.

ADMINISTRATIVE JUDGE RUBENSTEIN: Were any LCO's violated at this high power?

WITNESS CASILLAS: No.

ADMINISTRATIVE JUDGE RUBENSTEIN: Were there any -- was there chugging observed during this time period, either in steady state --

WITNESS CASILLAS: On this, and I understand it to mean in the signals of power distribution, whether you see any kind of additional --

ADMINISTRATIVE JUDGE RUBENSTEIN: I'm looking for any indication of new thermohydraulic phenomena, which had been hypothesized --

WITNESS CASILLAS: We understand. The noise will be amplified, but it is not any different than the noise that you see at comparable conditions.

ADMINISTRATIVE JUDGE RUBENSTEIN: Were there any observable system interactions between the components of the core, or other components, or any system interactions as a result of operating at a higher power?

WITNESS CASILLAS: There was a series of tests performed of the control systems, where perturbations were introduced in pressure and flow. And there was a criteria for a damping requirement and the noise requirement. All of that is part of the EPU startup test program to conclude that the system response is the same, the signature behaves the same way.

So all of that was performed satisfactorily.

ADMINISTRATIVE JUDGE RUBENSTEIN: Were there any observations of this nature in any other BWRs, and I will throw it out as world-wide, of thermohydraulic phenomena, to your knowledge? I mean it is all, it is probably all encompassing of all the plants in the world, but to your knowledge?

WITNESS CASILLAS: I'm not sure of --

ADMINISTRATIVE JUDGE RUBENSTEIN: Any experimental evidence of thermal, of new or abnormal thermohydraulic behavior?

WITNESS CASILLAS: We don't know of any.

ADMINISTRATIVE JUDGE RUBENSTEIN: Okay.

CHAIR KARLIN: When you say you don't know of any, there are none at all? We are not using the word significant, we are just saying any, any. You hesitated.

First off, your familiarity is limited. When you don't know of any it means how many have you ever -- experimental is probably the correct word. Have there been -- let me just back up.

WITNESS CASILLAS: Okay.

CHAIR KARLIN: Experimental, I'm not sure whether that -- experimental to me means someone did a large transient test --

ADMINISTRATIVE JUDGE RUBENSTEIN: I said observed.

CHAIR KARLIN: So we are not talking about an experimental test, we are talking about actual unplanned events?

ADMINISTRATIVE JUDGE RUBENSTEIN: No, we are talking about steady state operation at high power. I haven't got to transients yet.

CHAIR KARLIN: Okay.

WITNESS CASILLAS: And why I hesitate is because we have seen differences.

CHAIR KARLIN: And who is we, you?

WITNESS CASILLAS: I and our engineering department.

CHAIR KARLIN: You personally have been involved in some of those?

WITNESS CASILLAS: Yes.

ADMINISTRATIVE JUDGE RUBENSTEIN: I did ask you about differences, I expect differences in the power shape. I'm talking about abnormal unexplained thermohydraulic phenomena.

WITNESS CASILLAS: No, unexplained is the key. We have, different utilities have observed certain things. And they have referred those to us. And we have examined them, and we have acknowledged them and understood.

And so they are not abnormal.

CHAIR KARLIN: And so you are saying there have been abnormal but you have subsequently been able to explain them?

WITNESS CASILLAS: They have not been anticipated.

CHAIR KARLIN: Unexpected?

WITNESS CASILLAS: Right.

CHAIR KARLIN: Not predicted?

WITNESS CASILLAS: And there is differences in that.

CHAIR KARLIN: All right.

ADMINISTRATIVE JUDGE RUBENSTEIN: You said differences in expected behavior?

WITNESS CASILLAS: Yes.

ADMINISTRATIVE JUDGE RUBENSTEIN: Is this also, is this primarily a steady state? Go ahead.

ADMINISTRATIVE JUDGE BARATTA: Wait a minute. The problem with that, though, is that before an anticipated operational occurrence happens, you are at steady state.

So if you have a situation that wasn't anticipated, that sets a different set of conditions for that occurrence, correct?

WITNESS CASILLAS: Well, it depends on how we decide what this different behavior is. Some of the, let me give an example for that. This is behavior of periodic recirculation system corrections in flow.

So prior to uprate there was a certain frequency of this recirculation system flow corrections they would make. After the uprate the signature of this correction changed, and it was not something that was alerted, if you would, to the operators.

And so when they saw this revised signature it was brought to our attention, and we examined the data in detail and we said, yes, this change in signature is appropriate given the new thermohydraulic conditions that you have at EPU, therefore there is nothing new happen.

Now, this signature does not have anything to do with the safety analysis, or anything else, it is a new phenomena, or a new characteristic, if you will, that was not identified, that was not --

ADMINISTRATIVE JUDGE RUBENSTEIN: By signature you mean noise analysis?

WITNESS CASILLAS: It would be like noise analysis, right. It is a very specific core flow correction that occurs at some plants.

ADMINISTRATIVE JUDGE RUBENSTEIN: I think the answer is too complicated in the sense that you really didn't see anything that you couldn't explain.

WITNESS CASILLAS: Correct.

ADMINISTRATIVE JUDGE RUBENSTEIN: But didn't you expect the plant signature to change when you went from 100 to 120 percent?

WITNESS CASILLAS: Well --

ADMINISTRATIVE JUDGE RUBENSTEIN: Wouldn't noise analysis show that you have higher flow?

WITNESS CASILLAS: Yes, in general terms. But there is always very specific things that operators, plant operators, that are very familiar to how their plant operates, that they notice different things.

And so those things, if they deemed sufficiently important, they are referred back to their own engineering group, and maybe -- and some of them have come down to General Electric, also.

And so we have had a few of those that we have known.

CHAIR KARLIN: I'm not sure whether I'm on the same topic, this may not be thermohydraulic, but as I understand it, and this would be for Mr. Casillas, at the moment, and maybe Mr. Nichols could answer a little bit.

In the ascension, progress of the ascension of power to the 20 percent level, is it correct that there were some acoustic signals, noise that were heard, that were not predicted, or anticipated, and caused the facility to stop the ascension, increase in power?

Mr. Casillas, were you there, participated in that?

WITNESS CASILLAS: No, I only have second-hand knowledge.

CHAIR KARLIN: So Mr. Nichols that is probably your question.

WITNESS NICHOLS: I believe what you are referring to is the steam drier acoustic --

CHAIR KARLIN: Acoustic signals, they stopped it -- how many times did you have to stop?

WITNESS NICHOLS: We stopped three times, at 105, 112, and 117 and a half.

CHAIR KARLIN: And these were unplanned, right?

WITNESS NICHOLS: But not unexpected. We did analysis, and the nature of the steam drier monitoring plan, which is not related to the transient, this is a steady state analysis program, is similar to that done with piping systems, where you do an assessment, but you have to go get the plant data to finish the analysis, okay?

And what we submitted to the Staff and that they accepted was an analysis, here is where Vermont Yankee is at one hundred percent power, original licensed thermal power.

And we have a program that will monitor, and we have this significant amount of margin, and we will stop at any time where any portion of the acoustic signal touches a conservative line that we set, an acceptance criteria.

What Mr. Casillas referred to as a level two criteria. And then we looked, and just to digress for a second, what it is that causes that signature, that acoustic noise, is the steam going past the stub tube, and it goes past, like, a flue.

And our engineer, Mr. Betty, was able to calculate, based on the geometry, etcetera, of the main steam lines, and those branch connections, the frequencies at which those perturbances would occur, but not the magnitude.

You have to go out and measure that. So what we had was a conservative set of criteria. In fact it came up, it hit it, we knew what it was, it was the safety relief valve frequency at 137 and 143 hertz.

We stopped at those, reanalyzed, as set by the condition.

CHAIR KARLIN: Hold on one second. You reanalyzed. Initially you had an analysis of what would happen?

WITNESS NICHOLS: No, we had an analysis of --

CHAIR KARLIN: What you expected to happen?

WITNESS NICHOLS: No.

CHAIR KARLIN: Well, why did you reanalyze it?

WITNESS NICHOLS: We had an analysis of the acoustic signature F, original licensed thermal power, let's refer to it as one hundred percent power.

CHAIR KARLIN: Okay, yes.

WITNESS NICHOLS: When we got up the curve changed a little. It was like this before, now it is like this. And we touched that limit at that frequency.

We reanalyzed now at 105 percent power, reanalyzed what is the structural load on the drier with this new signature, and what is our new margin. So in this particular case we went from about 1800 PSI load on the drier, to a little over 2000 PSI, with a limit of 13,600.

We reanalyzed it, we generated a new set of acceptance criteria.

CHAIR KARLIN: The reason you reanalyzed, my understanding is you went into doing this with a certain set of understandings and expectations, and predictions of what would happen. And this was not, although not totally unexpected, not planned to happen, but it did.

WITNESS NICHOLS: No, we had plans for it in our procedure.

CHAIR KARLIN: You had plans that it would go over this level that you had set?

WITNESS NICHOLS: No, that it could go over that level.

CHAIR KARLIN: Well, yes, it could. But you didn't plan for it to go over that level, did you? You didn't say it will be going over this level, we know it is going to go over this level.

WITNESS NICHOLS: We expected that it would.

CHAIR KARLIN: You did?

WITNESS NICHOLS: Yes.

CHAIR KARLIN: So why did you have to reanalyze?

WITNESS NICHOLS: Because you can only reanalyze based on the actual signature you have at the current power level.

CHAIR KARLIN: So this happened three times?

WITNESS NICHOLS: That happened three times. And in fact it happened, just to be clear, when we got to 120, exactly, we hit that limit again.

CHAIR KARLIN: You got more data, and you did a further analysis --

WITNESS NICHOLS: Right, we ultimately did the final analysis at 120 to come up with 4,000 pounds.

CHAIR KARLIN: And I understand this is a totally different test, and it is not the large transient test we are referring to, but there was a question in my mind as to the accuracy of a prediction and an analysis, and the reality.

WITNESS NICHOLS: It was not a prediction tool. Similar to piping analysis, you go out and you measure the vibration on the pipe, you then put that back in the analysis. You took the plant data on the drier and put it back in the analysis.

CHAIR KARLIN: Okay, that is helpful.

ADMINISTRATIVE JUDGE RUBENSTEIN: While we are into this subject, there has been a concern that the steam drier structural integrity could be affected by the EPU because the increase flow velocity at EPU conditions increases turbulence at vortex threading frequencies, and loads on the drier.

Would you characterize this as it exists in terms of time frame of these effects, are these something that would be related to the transient, and in what way?

WITNESS NICHOLS: These are mostly steady state long-term effects, flow induced vibration effects, okay? And the analysis we did for the Staff, for our analysis, looked at both the acoustics that Judge Karlin referred to, and also did a computational dymamics model, as a sensitivity, to see what was the relative contribution of vortex shedding load.

And it was a relatively new analysis, the Staff had questions about that analysis. But what it revealed was the vortex shedding, or CFD load, are not a large contributor. And those are just a calculational model, because you don't measure those.

ADMINISTRATIVE JUDGE RUBENSTEIN: I'm only interested in the behavior of the steam driers, which is not a subject of this enquiry, insofar as it might change the input conditions to the transient, and how the result in pressure wave in the transient might affect those components.

WITNESS NICHOLS: And in the case of the steam drier, the steady state analysis was done for the steam drier, which refers to the vortex shedding that you are talking about.

The upset conditions that Mr. Casillas referred to are a separate analysis, with the drier structurally intact, it is a different analysis, it is not out of the ODYN analysis, it is done under different conditions for what are the upset and faulted conditions for the drier.

And they are not challenged, or evaluated part of large transient testing.

ADMINISTRATIVE JUDGE RUBENSTEIN: So what would a large transient test, if it were required, do to provide closure on these questions?

WITNESS NICHOLS: The pressure wave, coming back through the main steam lines, the first thing that we would see would be the front face of the drier, because that is directly opposite the nozzles, the main steam line nozzles.

So as it is coming back, the pressure wave back, the first thing it would hit, which happens to be one of the things we modified on the drier was the front face, and took it up to a full one inch face.

But we did a separate analysis. And the load on that is not a long-term flow induced vibration load, it is a short term load that is well within margins.

ADMINISTRATIVE JUDGE RUBENSTEIN: Thank you.

WITNESS CASILLAS: It is worth to note that we discussed this, the wave for MSIV closure, and the turbine trip is a very short duration wave. There is one impulse, and it is the magnitude of such a thing is determined using another conservative methodology that is used in design.

The test, in itself, would give you no information on the loads on the drier.

ADMINISTRATIVE JUDGE RUBENSTEIN: We are going to get into those aspects a little bit more. In exploring the new area, let's talk a little bit about ODYN and the one-dimensional kind of dynamic code.

WITNESS NICHOLS: Excuse me, would it be possible, at this point, to request a short break?

CHAIR KARLIN: You need a break? That is no problem. Why don't we take a ten minute break, or nine minute? We will reconvene at 2:30 by that clock, okay?

WITNESS NICHOLS: Thank you.

CHAIR KARLIN: We are adjourned.

(Whereupon, the above-entitled matter went off the record at 2:21 p.m. and went back on the record at 2:30 p.m.)

CHAIR KARLIN: Mr. Nichols, Mr. Casillas, please, I just want to remind you that you are still under oath, and thank you for being patient. We have some more questions for you.

ADMINISTRATIVE JUDGE RUBENSTEIN: We are going to talk a little bit about the analytic of ODYN.

A little preamble. Back in 1981 General Electric got an LETR approval on the ODYN code, which is compared to Reddy. I think it was '81.

And then the Staff made a safety evaluation, a number of conditions, which changed the ODYN code. Then it was compared, approximately four plants, and perhaps modified. And then, later, it was used and evolved over the years, as your counsel said, to a more mature version of the code.

And I have to admit I'm confused. I have heard the terms best estimate code, I've heard the terms licensing code. I darn well know it is not a theoretically derived code, so please characterize it for me.

WITNESS CASILLAS: Before I answer the question I would like to answer the pending question we had from the morning session regarding the thermal cycles information.

ADMINISTRATIVE JUDGE RUBENSTEIN: As long as you remember my question.

WITNESS CASILLAS: Well, I'm going to have to ask clarification first.

ADMINISTRATIVE JUDGE RUBENSTEIN: Please do.

WITNESS CASILLAS: From your question,

also. But I think what we left pending was how many cycles is the plant, are considered in the design of the plant, and how many cycles have we accumulated so far?

And what we have been able to gather is that the design of the plant is based on a lifetime scram cycles of 270. And the precise number that VY has experienced, to date, we do not have the exact number.

However, we know that it is between 70 and 100 at this time. Now, in a sense the frequency, the recent frequency of these thermal cycles is that the plant doesn't see some of the cycles over a one or two year time.

So by introducing one year, essentially accelerating for that period of time, something that you wouldn't see in two years, you are going to do a test and have that cycle.

So going back to the question of Judge Rubenstein.

ADMINISTRATIVE JUDGE RUBENSTEIN: Can you describe what kind of an animal the ODYN code is, is it a tomb code? If so tell me where it was tombed.

WITNESS CASILLAS: YEs. The code, the ODYN code was a very advanced code at the time that it was written. It was the best in the industry, at the time. And so it -- the ODYN code replaced the REDDY code, which had been used since the '60s, to predict transient, and formed the basis for the predictions during the early '70s, that all the plants met successfully.

And so the ODYN code was developed, again, specifically in the late '70s, and it included several major improvements over the old, over the existing code.

And one important aspect of all of that had to do with the steam line model, which was the critical aspect that was incorporated in the ODYN code. And so for that purpose we had the three Peach Bottom turbine trip tests, that were specifically run and carried out to ascertain the characteristics of the steam line modeling.

A model that had been under development, and under study, both by the NRC and General Electric for some time before that. And so it was determined, at the time, that those tests would be the best way of determining what that model really needed to be.

So then the ODYN code was a result of that model improvement. And it included several other improvements. Now, the code was designed as a best estimate code. And that is that all the correlations that were put into it were based on the expected phenomena, that is the void quality relationship, the pressure drop, the neutronics, were all best estimate.

Now, there were some accommodations made for the simplifications when you go to a three dimensional, to one dimensional, things aren't linear. So obviously you adapted the model so that you would get the best, and you would be able to predict a three dimensional phenomena with a one dimensional code.

And so there was a lot of modeling that was done to get the ODYN code to do a best estimate prediction of the phenomena. Now, initially, the ODYN code was focused strictly on pressurization transients, because the steam line modeling was the important part that was done.

And, in fact, it was only applied to, as you probably saw in the SER, it was only applied to pressure increased transients. And that was the practice for many, many years.

And the other less advanced, and more conservative model continued to be applied for all the other transients. So only for pressure transients. Now, when we talk about best estimate, it is that we didn't incorporate any deliberate conservatisms, or biases, into the model itself.

However, because it is a simplified model it will inherently result in biases, and inaccuracies. And so the ODYN code has some biases. Even though it is, by its nature, a best estimate model.

Now, these biases result in an on the average overpredicting overpowers, and overpressures, in transient analyses. However, the degree of the overprediction is not so large as to, say, we are going to accept the prediction as an acceptable bounding result.

The NRC has required that we examine the accuracy of the ODYN code and apply a correction to its results, before they are applied to design analysis.

ADMINISTRATIVE JUDGE BARATTA: So it is a licensee code?

WITNESS CASILLAS: No, the analysis is a -- we applied the nominal model in a licensing method. So what we do is we take, and this is prescribed in our proprietary document, we have a procedure by which that we apply to the ODYN code, a nominal code, and we apply it using that method to come up with an acceptable licensing result.

So now when we use it for purposes of

predicting a nominal system response, like we would for the test, so if VY was to conduct a test, and we were to pre-predict, or post-predict that test, we would use ODYN exactly as it is.

ADMINISTRATIVE JUDGE BARATTA: I guess I'm a little confused, because I looked at some of the results that you provided, and I noticed, as I think NEC has pointed out, that some of the results are considerably more than a few percent off of the observed values.

So I would appreciate it, in your discussion, if you could maybe talk a little bit about -- it is more than just simply the collapsing of the 3-D down to the 1-D model that is -- because there are other codes out there that produce far better results, i.e., more consistent with observed powers, and such.

What I see here is 25/50 percent of power fix, I get a little concerned.

WITNESS CASILLAS: You need to be specific as to what you are pointing out, to the specific document.

ADMINISTRATIVE JUDGE BARATTA: Well, it seems to me that in the original document, this was 02NEDO24154A, it is in one of the exhibits.

WITNESS CASILLAS: This is the

qualification volume 2?

ADMINISTRATIVE JUDGE BARATTA: I think it is actually volume 1 I have, because I'm looking at the Staff's summary, or the summary that is in there, I'm sorry.

Yes, it is Entergy exhibit number 26, GE. These are comparing some bottom curve and trip here. It looked like there were some significant variations there. And I wasn't going to get into this until later, where the system looked to me like it hadn't done that good of a job on predicting that.

I realize this is version 4, I think, of the code, or even earlier.

WITNESS CASILLAS: Version 2.

ADMINISTRATIVE JUDGE BARATTA: Okay. And there may be better results since then. But I wanted to understand that. If the thoughts that are in there are representative of typical results, or what?

WITNESS CASILLAS: I would be glad to discuss any specific results.

ADMINISTRATIVE JUDGE BARATTA: I'm trying to find them. I had them up here. I think it is page, take a look at page 60. There is feed bottom curve and trip neutron power.

WITNESS CASILLAS: Page 3-60, or 2-60?

ADMINISTRATIVE JUDGE BARATTA: Hold on a second. I'm sorry, 2-46 is what I'm looking at.

WITNESS CASILLAS: Is it roman numeral two?

ADMINISTRATIVE JUDGE BARATTA: Yes, roman numeral II-46, figure 4.

WITNESS CASILLAS: Yes, that is part of the NRC summary review.

ADMINISTRATIVE JUDGE BARATTA: Right. And I assume that the model refers to the Peach Bottom reactor model, and the ODYN code results that came from that model. And that would be the solid line in that figure.

WITNESS CASILLAS: Yes.

ADMINISTRATIVE JUDGE BARATTA: And what looks like the dashed line is the data?

WITNESS CASILLAS: Correct.

ADMINISTRATIVE JUDGE BARATTA: And I look at that and there is a significant difference between the magnitude of the peak in the data, and the magnitude of the peak as projected.

And while I would agree that it is conservative, I wouldn't agree that represents a best estimate calculation. And I was curious as to why that -- you mentioned there were some conservatisms in your testimony, and also just -- I wanted to get a little bit better understanding.

WITNESS CASILLAS: This is the -- these transients have a very fast peak. The duration of this is about two-tenths of a second or so. And in the magnitude of this is controlled by several nuclear characteristics, such as fuel temperature, void distributions, and so on.

And it is the actual peak, as you may see in the discussion, the interaction between GE and the NRC, is that the magnitude of the peak, there is a large uncertainty as to what it is, and the magnitude of instantaneous peak is not really a very important parameter.

What it is very important is to capture the integrated effect. And the integrated effect is reflected into the heat flux, which determines the overpower magnitude that must be accommodated in the design, and the peak pressure that you will see in the reactor.

And so when we look at, even though we have a lot of history comparisons, and at face value they will look, they may look poor. But to the technologists that are trying to predict this, this actually is not very important, critical.

If it was a slow transient --

ADMINISTRATIVE JUDGE BARATTA: I guess for a best estimate code I would consider that it would be very important. I don't understand what your basis for saying that is.

WITNESS CASILLAS: I will --

ADMINISTRATIVE JUDGE BARATTA: Because those phenomena that you just identified, at least according to the code manual, should be represented by the code. I mean, you have front neutron characteristics and such in there.

WITNESS CASILLAS: This is, I differ with you. This is a very good prediction for the model, for one initial model. And in today's three dimensional models that are used today, to benchmark, they do -- they cut this difference in half.

You could still argue that it is big for the new models. This is a very difficult, for such a short duration spike, to predict it accurately. And, again, the important thing if the overall reactivity balance, which is reflected in both the heat flux and the peak pressure, which are the important parameters that --

ADMINISTRATIVE JUDGE BARATTA: I will reserve the further discussion, because I'm to the point where I'm going to ask you to produce the risk occurrence that you are talking about, because I assume that they are in some document.

WITNESS CASILLAS: Do you mean the three dimensional?

ADMINISTRATIVE JUDGE BARATTA: No. You said that the, what is important are the interval parameters.

WITNESS CASILLAS: Correct.

ADMINISTRATIVE JUDGE BARATTA: I only see power here, I'm interested in the pressure response as predicted by the code. And it is not in this particular volume. I assume it is --

WITNESS CASILLAS: It is in this volume, the qualification model.

ADMINISTRATIVE JUDGE BARATTA: Is it in volume 1?

WITNESS CASILLAS: No, you see, what you are looking at is the NRC summary --

ADMINISTRATIVE JUDGE BARATTA: Yes, I realize that.

WITNESS CASILLAS: -- of the complete, of the volume 1 and volume 2. And the part that you are referring to, that they discussed, is with information in volume 2, which includes the qualification of the code.

Volume 1 has only the technical description. So all of these plots come from volume 2.

ADMINISTRATIVE JUDGE BARATTA: Okay, whatever document I have did not have it in them.

WITNESS CASILLAS: You should have had volume 2, and volume 2 has all of those.

CHAIR KARLIN: Which exhibit is that?

WITNESS CASILLAS: Which one is volume 2? It is 27.

ADMINISTRATIVE JUDGE BARATTA: Because it was not obvious where that came from.

WITNESS CASILLAS: Because we issued the reports with the NRC SER.

ADMINISTRATIVE JUDGE BARATTA: Well, I will give you an opportunity to cite some figures in volume 2, at a later point, where you can convince me that is the best estimate code.

Could we turn to exhibit number 27?

CHAIR KARLIN: Where is it in exhibit 27?

(Pause.)

WITNESS CASILLAS: Volume 2, actually about half of volume 2, the first half is --

CHAIR KARLIN: When you refer to volume 2, are you referring to Entergy exhibit 27?

WITNESS CASILLAS: Excuse me, exhibit 27, half of that, half of this volume 2, is a repeat of the NRC SER, same, as is in volume 1. And approximately halfway through it is the, essentially the volume 2, GE volume 2.

And in there --

(Pause.)

WITNESS CASILLAS: The benchmark of ODYN to the turbine trip test is section 3. And so section 3 discusses all the agreement for the turbine trips. It has all the figures and it discusses the differences between each of the tests.

So I will just start with figure 3-6, on page 324.

CHAIR KARLIN: Ms. Carpentier, could you bring that exhibit, do you have exhibit 27 with you? It is taking a long time to download.

(Pause.)

CHAIR KARLIN: I'm sorry, could you start again, Mr. Casillas?

MR. TURK: I have extra copies of that exhibit that I can offer you to use, so you don't have to make copies.

CHAIR KARLIN: I think we had one, I'm

just asking our law clerk to grab it. It is taking a while to come up on the computer. These computers, they never work when you want them to. Paper is the key.

ADMINISTRATIVE JUDGE BARATTA: While Marshall's getting that let me ask you another question I had. Could you briefly describe the extent of independent verification that was done on the ODYN code, in other words outside of GE?

WITNESS CASILLAS: I -- well at the time when it was first licensed there were -- there was another test, another model run by the NRC as a confirmation. It was not run by General Electric.

ADMINISTRATIVE JUDGE BARATTA: Okay. Another was the ODYN code itself was wrong? I'm confused.

WITNESS CASILLAS: No. The -- in the process of having ODYN approved by the NRC, the NRC -- I believe the NRC had an alternate model run to determine whether, you know, how the --

ADMINISTRATIVE JUDGE BARATTA: So they did a code to code comparison?

WITNESS CASILLAS: They did a code to code, right, correct. Yes.

ADMINISTRATIVE JUDGE BARATTA: That's not quite what I had in mind but as long as we -- we've got the exhibit now. So what -- I'm looking at -- is it chapter 3? Is that what you're referring to?

WITNESS CASILLAS: Yes, chapter 3, starting in page 3-24.

ADMINISTRATIVE JUDGE BARATTA: It's 3-24?

WITNESS CASILLAS: Sure.

ADMINISTRATIVE JUDGE BARATTA: Is that roman numeral?

WITNESS CASILLAS: No. No, it is about three fourths of the way down.

ADMINISTRATIVE JUDGE BARATTA: Okay. I think I've got it now. I'm sorry. Okay, so figure 3-24 is the -- figure 3-6 is what you're talking about?

WITNESS CASILLAS: Correct.

ADMINISTRATIVE JUDGE BARATTA: Okay. And that shows the steamline pressure?

WITNESS CASILLAS: Or turbine trip one.

ADMINISTRATIVE JUDGE BARATTA: And that's basically showing, if I look at say the pressure after about 2 seconds, is roughly 1,020 psi is the actual and you're predicting about something on the order around 1,050. Is that correct?

WITNESS CASILLAS: Yes.

ADMINISTRATIVE JUDGE BARATTA: All right.

And I notice the first peak, which is approximately 0.3 -- no, probably about 0.4 seconds predicted versus about a 0.5 seconds actual, correct?

WITNESS CASILLAS: Yes. Yes, this is discussed in the SER.

ADMINISTRATIVE JUDGE BARATTA: Yes.

WITNESS CASILLAS: This early high peaks and low peaks, that was a result of the instrumentation pressure, instrumentation. We do not believe this is our real pressure. But there was --

ADMINISTRATIVE JUDGE BARATTA: I guess I still -- I mean to me it does look conservative.

WITNESS CASILLAS: Yes.

ADMINISTRATIVE JUDGE BARATTA: But I say that as opposed to best estimate looking at these figures. And --

WITNESS CASILLAS: Yes. And there's great discussion as to why the prediction is the way it is and why the test results are the way they are, and where they interact.

ADMINISTRATIVE JUDGE BARATTA: Well I'm looking throughout these figures. I mean I don't see --

WITNESS CASILLAS: So this is --

ADMINISTRATIVE JUDGE BARATTA: Do you have another example which the agreement is better?

WITNESS CASILLAS: Well the important part is figure 3, 9, 10, and 11. Those are the dome pressures. That's when it's actually used to determine the reactor pressure.

ADMINISTRATIVE JUDGE BARATTA: Again I see a conservative number.

WITNESS CASILLAS: Correct, of pressure.

ADMINISTRATIVE JUDGE BARATTA: Which then says it's not a best estimate code.

WITNESS CASILLAS: Yes. And what is -- this is a bias of the model. It is not a built in --

ADMINISTRATIVE JUDGE BARATTA: Right. Could you explain -- what I was asking, could you explain what the --

WITNESS CASILLAS: Yes.

ADMINISTRATIVE JUDGE BARATTA: -- where the bias originates? It's got to me more than simply collapsing from a 3D geometry down to a 1D.

WITNESS CASILLAS: No, this is -- the reason for the increased pressure was -- is because of the mixing effectiveness of the heat water, that it condenses some of the steam at the longer end.

And the ODYN model does not include such condensing efficiency. And so the pressure will hang higher.

ADMINISTRATIVE JUDGE BARATTA: Okay. All right. That's fair. I understand what you're saying. Now what are the other similar conservatisms that are in that code?

WITNESS CASILLAS: Well, that is a conservative bias, and so in pressure it is -- we both -- we've seen it very much in terms of power.

ADMINISTRATIVE JUDGE BARATTA: I mean that would also some into play, would it not, and to a certain extend the MSIV closure too where you do get some --

WITNESS CASILLAS: Correct. Same thing.

ADMINISTRATIVE JUDGE BARATTA: Same thing.

WITNESS CASILLAS: It's the same phenomena, the same phenomena, a little bit different timing.

ADMINISTRATIVE JUDGE BARATTA: Right.

WITNESS CASILLAS: It is the same phenomena and that's why the Peach Bottom tests, which were -- or the turbine trip tests that are the basis for this qualification are sufficient for any kind of pressure transient because it is the same phenomena whether you have a pressure regulator failure, whether you have an MSIV closure, whether you have a turbine trip.

ADMINISTRATIVE JUDGE BARATTA: Right.

WITNESS CASILLAS: It's all the same problem. Okay. So -- and again in -- okay. Now other simplifications, this isn't the -- and older rods move essentially at the same speed into the reactor, and we take an average speed whether it be measured from all the rods or whether it would be the limit, the bounding, the slowest speed as allowed by the technical specifications.

In reality we know that if -- that the faster control rods have a stronger influence than the slower control rods. So naturally by taking an average speed we're going to be under predicting the power, the reactivity in the reactor. So that's a bias --

ADMINISTRATIVE JUDGE BARATTA: But that would also be true of any 1D code because it's usually representative?

WITNESS CASILLAS: Any 1D code will do that.

ADMINISTRATIVE JUDGE BARATTA: Right.

WITNESS CASILLAS: Correct.

ADMINISTRATIVE JUDGE BARATTA: Okay. But even though that's bias --

WITNESS CASILLAS: It's a bias, and that's why we tend to have small - they're not big. It's not a big bias, but it is a consistent bias.

ADMINISTRATIVE JUDGE BARATTA: Okay. Is there anything else that would be pertinent to the MSIV closure or the turbine trip -- the low rejection transient that would be considered to be a conservative bias?

WITNESS CASILLAS: The other conservative bias is the average properties in the reactor. Again, it's a three dimensional effect. It is -- when you use the average properties, where as in -- nuclear physicists will know that there's a great smearing effect of that.

And so the higher power elements will not be as important as --

ADMINISTRATIVE JUDGE BARATTA: Right, it will only capture that if you go --

WITNESS CASILLAS: Right.

ADMINISTRATIVE JUDGE BARATTA: -- to a 3D core model?

WITNESS CASILLAS: Correct, correct.

ADMINISTRATIVE JUDGE BARATTA: You do use, as I recall, 1D kinetics, is that --

WITNESS CASILLAS: 1D kinetics, that's

right. In fact the previous model was a point model kinetics, and so when we went from point model kinetics to 1D was a very large improvement.

ADMINISTRATIVE JUDGE BARATTA: Yes. That's what's in this version that was used to analyze --

WITNESS CASILLAS: 1D, one single element.

ADMINISTRATIVE JUDGE BARATTA: Right.

WITNESS CASILLAS: Correct, axial. So that is -- that was a big improvement from the previous models. So --

ADMINISTRATIVE JUDGE BARATTA: So those are the principle conservatisms?

WITNESS CASILLAS: Those are the principle conservatisms, correct.

ADMINISTRATIVE JUDGE BARATTA: All right. You might want to think about it. I'm not going to ask you now, but later on I will ask if you could point me to comparisons with -- I think you rely heavily on Hatch for comparisons if I recall correctly.

WITNESS CASILLAS: Well let me say that this goes to the next phase of the ODYN model. As we said, we applied the previous model. We continued to be the approved licensing model for all the other transients.

And the ODYN model was only approved for pressurization transients. So in time we continued to make improvements to ODYN for -- to be able to predict flow and level more accurately.

And in that process we introduced other comparisons to other transients. These were not tests like Peach Bottom. They were not benchmark tests.

They were -- this was -- these are all events, either that were part of start up, the case of the MSIV. It was an MSIV test that was run at start up at the plant Hatch for their cycle one.

For other cases they were just events that occurred at the plant, or maneuvers in order to improve it's capability. And so we added nodes, we added control systems, we added sub-models, mixing models.

So that allowed the code to have better predictions of some of these other events. Now when it came to the licensing arena, every time we changed the model officially for application to a power plant, we are required to re-perform the three Peach Bottom tests, and re-perform the comparison, and develop the uncertainties that are to be applied in design. So --

CHAIR KARLIN: Could I stop -- for

clarification, when you say re-perform the Peach Bottom tests --

WITNESS CASILLAS: Predictions.

CHAIR KARLIN: Okay. I mean as I understand it, Peach Bottom is a facility, a reactor where actual large transient tests were performed once upon a time many decades ago, right?

WITNESS CASILLAS: Yes.

CHAIR KARLIN: And they've never been re-performed, those tests on that facility?

WITNESS CASILLAS: Correct.

CHAIR KARLIN: Okay. So when you mean re-perform you mean re-analyze or something?

WITNESS CASILLAS: Yes, yes.

CHAIR KARLIN: Okay.

WITNESS CASILLAS: When we make a change to the model, whether it be a minor change or a large change, we re-perform the benchmark and determine the agreement between the test and the new model.

And that agreement becomes the basis of the application.

CHAIR KARLIN: Okay.

WITNESS CASILLAS: And over the years, of course, the agreement has improved, not large.

CHAIR KARLIN: As new data points are

gathered from various transients that occur in industry, you take that information and you try to put it into ODYN and improve ODYN.

Is that what you're saying? If it needs to be improved, or at least add the data in?

WITNESS CASILLAS: Well, yes. As we expand, as we do more and more design work with ODYN, then we recognize some of this bias, some of the simplifications, and find ways of improving it, especially with the much better computer capabilities that we have nowadays.

And so we've continued to improve ODYN, but it is basically the -- it hasn't changed a lot from the past, and our predictions are better.

CHAIR KARLIN: Okay. Sorry for the digression.

ADMINISTRATIVE JUDGE BARATTA: Have you -- I'm going to go ahead and go into more detail than I had planned at this point, so --

CHAIR KARLIN: That's okay.

ADMINISTRATIVE JUDGE BARATTA: Do you have anything you want to say?

CHAIR KARLIN: Oh, no. I'm enjoying it.

ADMINISTRATIVE JUDGE BARATTA: All right. During that time period we just looked at, the latter, not the first pressure peak but the second one that we were just talking about in figure 3- --

WITNESS CASILLAS: Six?

ADMINISTRATIVE JUDGE BARATTA: I guess 6, yes.

WITNESS CASILLAS: Yes, steamline pressure, right.

ADMINISTRATIVE JUDGE BARATTA: Does the -- do the steam dumps come into play there?

WITNESS CASILLAS: Excuse me? The steam dump?

ADMINISTRATIVE JUDGE BARATTA: Steam dumps, yes. Steam dumps. In other words, are the steam dumps opening at that point?

WITNESS CASILLAS: No. No, they do not open until after one second, about a second and a half or so.

ADMINISTRATIVE JUDGE BARATTA: Okay. I'm sorry. I'm talking about that time period after -- not the first pressure, --

WITNESS CASILLAS: Okay.

ADMINISTRATIVE JUDGE BARATTA: -- the second one.

WITNESS CASILLAS: Yes, yes.

ADMINISTRATIVE JUDGE BARATTA: Okay. Is

there any evidence to suggest that part of the bias there is due to -- it looks from your nodalization diagram that appears on page 3-55 that the

CHAIR KARLIN: Is that nodalization? Nodalization?

ADMINISTRATIVE JUDGE BARATTA: I'm sorry. It's not 3-55. There's a diagram of how you model --

WITNESS CASILLAS: Yes.

ADMINISTRATIVE JUDGE BARATTA: -- the steamline --

WITNESS CASILLAS: Correct.

ADMINISTRATIVE JUDGE BARATTA: -- somewhere in here. I don't remember what page, but it looked like the steam dump valves were modeled --

CHAIR KARLIN: It's one page before.

ADMINISTRATIVE JUDGE BARATTA: On page --

CHAIR KARLIN: It's 3-23.

ADMINISTRATIVE JUDGE BARATTA: It's 3-23?

WITNESS CASILLAS: Yes.

ADMINISTRATIVE JUDGE BARATTA: It looked like they were modeled fairly simply by -- over just a very simple valve. I mean --

WITNESS CASILLAS: Yes.

ADMINISTRATIVE JUDGE BARATTA: -- there was no attempt to do any characteristics or anything like that of --

WITNESS CASILLAS: Well the valves include a delay and opening characteristic, and in their model there is critical flows. And that's all there is. There's no --

ADMINISTRATIVE JUDGE BARATTA: But they don't include any allowance for heat up of the valve or anything like that?

WITNESS CASILLAS: No. No, the -- typically the valves will -- as you probably know, the certified capacity is ten percent less than the tested capacity, so the valves will generally pass ten percent more flow than they are credited with, but they're -- in the model they're credited just as --

ADMINISTRATIVE JUDGE BARATTA: Just as --

WITNESS CASILLAS: -- critical flow. We modeled the friction on the This, and the friction. So there is some losses in getting to the --

ADMINISTRATIVE JUDGE BARATTA: And which critical flow model is used? Do you know?

WITNESS CASILLAS: I believe it's the homogeneous model.

ADMINISTRATIVE JUDGE BARATTA: All right. I'm going to ask this question of some of the other parties later on too. You did say, as I understand it, it's a five equation mixture with the fifth equation being a mixture momentum equation as opposed to a full six equation model.

WITNESS CASILLAS: Okay.

ADMINISTRATIVE JUDGE BARATTA: And is that still true today?

WITNESS CASILLAS: Yes.

ADMINISTRATIVE JUDGE BARATTA: Okay.

WITNESS CASILLAS: Yes.

ADMINISTRATIVE JUDGE BARATTA: And you use a slip correlation in there?

WITNESS CASILLAS: You're taking now for the core?

ADMINISTRATIVE JUDGE BARATTA: Or they're talking about hydraulics in there, yes.

WITNESS CASILLAS: Yes.

ADMINISTRATIVE JUDGE BARATTA: And is that -- that's used throughout the code?

WITNESS CASILLAS: That is used -- well there's -- one correlation is used in the -- the slip correlation is used in the core and the homogeneous is used elsewhere.

ADMINISTRATIVE JUDGE BARATTA: Okay.

WITNESS CASILLAS: Yes.

ADMINISTRATIVE JUDGE BARATTA: Are any of the conservatisms that are observed attributable to that?

WITNESS CASILLAS: Well, we had a -- throughout the '80s there were some changes made on the nuclear -- on the physics models. And a portion of those had to do with the void correlation.

And so in the '80s we revised all our physics and hydraulic correlations. And so those -- the new correlations were put into ODYN also, the same physics part of it and hydraulic correlation.

As part of that we revised our void correlation that had --

ADMINISTRATIVE JUDGE BARATTA: When your talking about void correlation you're talking about void distribution?

WITNESS CASILLAS: Correct, the void distribution, right.

ADMINISTRATIVE JUDGE BARATTA: But the fundamental models in terms of slip and of being part of the equation are still the same?

WITNESS CASILLAS: Same, correct.

ADMINISTRATIVE JUDGE BARATTA: There's change?

WITNESS CASILLAS: Yes, hydraulic models are the same.

ADMINISTRATIVE JUDGE BARATTA: It's just you didn't make any changes to the slip correlations did you?

WITNESS CASILLAS: Well, no I believe that we had to make -- yes. We changed the slip model because we had no -- we didn't have -- we believed that we didn't have the best representation of voids at the time, and so we changed -- that was changed.

ADMINISTRATIVE JUDGE BARATTA: Okay.

WITNESS CASILLAS: The -- there was a small, I believe it was like a three percent correction to the voids.

CHAIR KARLIN: Could you try to speak up a little bit so that the public can hear?

WITNESS CASILLAS: Yes.

CHAIR KARLIN: That would be helpful, thank you.

WITNESS CASILLAS: Yes.

ADMINISTRATIVE JUDGE BARATTA: Why don't you go on and I'll think of a few more?

CHAIR KARLIN: I have a question. I'm not sure whether this is permissible on the section of the discussion, but it's a little bit more simplistic, which is you all have Exhibit 4, I guess it is, which is a Standard Review Plan that the Staff uses to try to decide whether or not to grant an exemption from large transient testing.

And at page 14219, I guess it is, of Exhibit, I think your Exhibit 4, there's -- one of the factors is margin reduction and safety analysis results for anticipated operational occurrences.

Then I turn to your Exhibit number, was it I believe 5, which is your proposed technical specification, your justification for the exception. I didn't find in there, did you, and I'll address this to Mr. Nichols I guess first, did you address that factor in your justification?

WITNESS NICHOLS: If I could refer to Exhibit number 5.

CHAIR KARLIN: Yes, please. And I believe you had a -- an update in Exhibit number 6, which is a supplement to that. So did you discuss it? I just missed it if you did.

Margin reduction and safety analysis, that's a factor that I didn't see discussed. Maybe it's there.

(Pause.)

CHAIR KARLIN: I'm on page 9, 14.2.1.9.

WITNESS NICHOLS: In response to your

question about using factor E --

CHAIR KARLIN: Right.

WITNESS NICHOLS: This is the margin reductions. What we did in response to that section was provide the analysis results, change. If you read that, what is the change in results for the two events.

CHAIR KARLIN: Okay. So if you take me to -- I guess we're on Exhibit 5 and you can point me to the section that that's covered or something. Your justification for exception to large transient testing, is it somewhere in there?

I mean I'm just missing it if -- The SRP is Exhibit 4. And then their justification is Exhibit 5.

WITNESS NICHOLS: What page in Exhibit 5?

CHAIR KARLIN: I don't know. I'm not finding any Exhibit 5. That's why I'm asking.

(Pause.)

CHAIR KARLIN: I mean I just don't see it discussed unless it's hidden somewhere.

WITNESS NICHOLS: You're talking about the margin exception, right?

CHAIR KARLIN: Yes.

ADMINISTRATIVE JUDGE BARATTA: I don't

mean to testify, but it seems to me that I recall vaguely something being said in the GE constant power pressure power uprate about margin reduction effort.

It was something with the fact that you're not changing pressure and therefore the margin reduction is not significant. Is that --

WITNESS NICHOLS: Right. We cite that in here. That's the generic statement in the CLTR. The CLTR states the same performance criteria will be used.

CHAIR KARLIN: So it is correct that the justification, Exhibit 5 and 6 I would say, I don't want to, you know, skip anything which is your supplement to the justification -- don't discuss that factor?

WITNESS CASILLAS: It doesn't appear to be specific.

CHAIR KARLIN: Okay. All right. Well that's all I want. I mean the document speaks for itself. I can go back and read it again, but you know, I thought you might be able to point me quickly to something, and apparently not.

WITNESS CASILLAS: Yes, the --

CHAIR KARLIN: And I believe I heard you testify earlier that the -- I guess there's another factor which is risk implications factor G in the Standard Review Plan and you did not discuss that either.

And you had a reason for not discussing that one.

WITNESS NICHOLS: Yes. And as I testified earlier, we chose to do this on the data itself versus the so-called risk implications or PRA perspective.

CHAIR KARLIN: All right. So you chose not to discuss factor G?

ADMINISTRATIVE JUDGE RUBENSTEIN: Does the SRP offer you an alternative then? This is, either do you give us a risk analysis or give me an analytical data represented --

WITNESS NICHOLS: I would have to go back and read that to --

CHAIR KARLIN: It will speak for itself.

ADMINISTRATIVE JUDGE RUBENSTEIN: So you defer that to the Staff.

ADMINISTRATIVE JUDGE BARATTA: Your basis then was deterministic --

WITNESS NICHOLS: That is correct.

ADMINISTRATIVE JUDGE BARATTA: -- as opposed to probabilistic?

CHAIR KARLIN: Yes, I mean the --

ADMINISTRATIVE JUDGE BARATTA: So we have this word risk associated with the right --

CHAIR KARLIN: Factor G does start with the proposition risk implications. For cases where the licensee proposes a risk informed basis for not performing certain transient tests, blah, blah, blah. And I guess you're saying that is not your case.

WITNESS NICHOLS: That is correct.

CHAIR KARLIN: So you're not using -- so you didn't discuss factor G.

ADMINISTRATIVE JUDGE RUBENSTEIN: You preferred a deterministic basis?

WITNESS NICHOLS: Pardon me?

ADMINISTRATIVE JUDGE RUBENSTEIN: You preferred a deterministic basis?

WITNESS NICHOLS: That is correct.

CHAIR KARLIN: I had another question. I'm not sure whether I'm still on the proper topic or not, but I believe it's answer 39 in your testimony. And I think we've already touched on this, probably to it fairly well, but I might not have understood it.

As I understand it, in that section you testify, and I believe that's -- Mr. Casillas is testifying at that point that the only thing that the ODYN code predicts is the peak pressure.

And the statement is made no other loads on the vessel or its components are derived from the over-pressure transient analysis, therefore stresses on components are not direct outputs of the ODYN simulations. Right?

WITNESS CASILLAS: Right.

CHAIR KARLIN: Does that mean ODYN only predicts peak pressure, it doesn't predict any of the other things we need to be concerned about?

WITNESS CASILLAS: No. Not -- well for purposes of the test, for the purposes of running the test --

CHAIR KARLIN: Running a large transient test --

WITNESS CASILLAS: A large transient test.

CHAIR KARLIN: -- an MSIV test.

WITNESS CASILLAS: The acceptance criteria would be whether the predicted or expected pressure as given by the analysis code used in licensing.

CHAIR KARLIN: No, wait a second. Wait a second. Let me stop you there.

WITNESS CASILLAS: All right.

CHAIR KARLIN: If you run a large -- the MSIV transient test --

WITNESS CASILLAS: Correct.

CHAIR KARLIN: -- is the only think you're looking for is whether it conforms to the ODYN prediction? No. Well answer -- I mean generally I want to know.

Is that the only thing, or what about there's a large complex system with 20 modifications that have been made, and maybe the integrated -- what happens, you know.

WITNESS CASILLAS: Okay. Yes.

CHAIR KARLIN: Is this system going to work or not?

WITNESS CASILLAS: Yes. Yes.

CHAIR KARLIN: So let me back up. Is the only thing that -- MSIV thing, the only thing were interested in, whether it meets ODYN?

WITNESS CASILLAS: No.

CHAIR KARLIN: No, okay.

WITNESS CASILLAS: No. I alluded to that fact, I think, on the earlier discussion, that a level one acceptance criteria for those tests is whether the expected -- the predicted power and pressure as predicted by ODYN or the design code are consistent with the plant behavior.

And so those two parameters become a level one criteria. Now ODYN will predict several other parameters, level, flows, pressure drops, and so on. But -- and some of those things are going to be measures at the plant.

But the criteria for the plant behavior will be not does it agree with ODYN, but is this the right response.

CHAIR KARLIN: Right.

WITNESS CASILLAS: And certainly if it is not the right response, if the equipment does not respond the way that it's supposed to respond, then that needs to be addressed as part of the test.

CHAIR KARLIN: So conformance to the --

WITNESS CASILLAS: So now ODYN will predict all those things, and if the level in ODYN drops ten inches below what actually the plant saw, we wouldn't be surprised of that because we know that ODYN has biases.

And if ODYN did not predict the same exact steam flow then we know that's going to introduce other biases. And so we'll look at the data, at the way that the plant behaved, and we see how the things are different, and you are expected to behave differently.

So certainly that is -- that's affirmative to your statement. You examine the whole event as a whole. And the same thing happens when an unplanned event occurs.

The safety significance of that is that, and you can see on all the LERs they all say what is the safety significance of this.

CHAIR KARLIN: Okay.

ADMINISTRATIVE JUDGE RUBENSTEIN: I've got a clarifying conclusion, but go ahead.

CHAIR KARLIN: Well I'm going to start on another go around for another three or four hours, so --

ADMINISTRATIVE JUDGE BARATTA: You've been very helpful in showing me where the comparisons were, the Peach Bottom. In question number 37 though, it says on page 15 of your testimony, it says the ODYN model was later also qualified against MSIV transient data.

Could you point to me in the exhibits where that is discussed so I can get a sense of comparison there, along similar lines with what I asked for Peach Bottom.

WITNESS CASILLAS: Yes. Well this is an interesting aspect, as I pointed earlier. Officially the -- only the Peach Bottom tests are really part of the official benchmark, if you will, of the ODYN code for official licensing application.

Now by -- the GE on it's own has performed many benchmark studies, or several other benchmark studies for some of these other models. And those -- that is what I'm alluding here on this question on 37, that also an MSIV event was compared, if you will, against the ODYN predictions.

And this was at a time when we were making reactor annulus changes in determining what would be the best way of modeling that for purposes of water level predictions.

And so because the pressure, a severe pressure such as an MSIV, it's important in the level collapse we chose this event for bench marking against water level.

So in the -- there is a reference to that, however that actually is a proprietary report.

ADMINISTRATIVE JUDGE BARATTA: Is it one that you provided to us that we could discuss in a closed session?

WITNESS CASILLAS: Yes.

ADMINISTRATIVE JUDGE BARATTA: All right. I'll reserve that then for discussion in closed session. Could you then further enlighten me then --

maybe this is more appropriate for the Staff, how -- there's a statement in here that the ODYN code was accepted for -- oh, GE has qualified the ODYN code against all significant plant transients and the NRC has accepted that the code is dependable -- well, that's not in quotes, code. That's a statement that appears on page 14.

WITNESS CASILLAS: Yes.

ADMINISTRATIVE JUDGE BARATTA: I guess -- is that also in that proprietary material that I assume --

WITNESS CASILLAS: Yes. Volume 4 of -- so we've discussed Volume 1 which is nonproprietary. It includes the technical description of the code. Volume 2 contains the qualification against the Peach Bottom and KKM tests.

And individual correlation qualifications, those two are nonproprietary. Volume 3, which includes the actual application of the code to design analysis, that's Volume 3.

And then Volume 4 is the more recent one which expands the qualification of ODYN to several other events such as flow and inventory transients. And so what we have in those two is comparisons of ODYN against flow events and inventory events.

ADMINISTRATIVE JUDGE BARATTA: What I'm trying to understand is you're in part, I believe, and if I'm putting words in your testimony please correct me, but I thought in part, reading your testimony, you were relying on, amongst other things, the ability of ODYN to predict an MSIV closure and a turbine trip had justification for not performing large transient testing.

WITNESS CASILLAS: Well really, the original code, the ODYN '02 code is substantially sufficient to predict MSIV closure and turbine trip, any kind of pressurization transients, that was its approval basis.

It was based only on the turbine trip tests. Now, in reference as to whether ODYN is best estimate code, whether it can -- it's able to predict other parameters acceptably, we call your attention to the other studies that have been submitted.

ADMINISTRATIVE JUDGE BARATTA: Well, I'm primarily interested in the MSIV.

WITNESS CASILLAS: Yes, there's nothing there.

ADMINISTRATIVE JUDGE BARATTA: I thought maybe there was something in there that would --

WITNESS CASILLAS: No.

ADMINISTRATIVE JUDGE BARATTA: -- shed light on that.

WITNESS CASILLAS: Nothing.

ADMINISTRATIVE JUDGE BARATTA: That's fine. All right. I guess I --we're independent. I don't care what the Staff's done.

WITNESS CASILLAS: Correct.

ADMINISTRATIVE JUDGE BARATTA: Okay. We make a judgement based upon the information presented at this hearing along with the previously filings, okay?

And current code validation efforts require you not only to do one transient, but to do representative transients that you intend to use the code for.

WITNESS CASILLAS: I don't follow you.

ADMINISTRATIVE JUDGE BARATTA: Okay. If you go to look at how people currently qualify in codes worldwide, not just in the United States --

WITNESS CASILLAS: Correct.

ADMINISTRATIVE JUDGE BARATTA: -- people don't accept the Peach Bottom turbine trip for qualified code for use on an MSIV closure. So I would appreciate it if you would think about the discussion we could have in the proprietary session to show me how you qualify the code, why you consider the code qualified for an MSIV closure.

I do fully understand what you're talking about, condensate mixing and that, because I ran into that in a situation with an older version.

WITNESS CASILLAS: Yes.

ADMINISTRATIVE JUDGE BARATTA: All right. So I'm fully familiar with that and I do know it's an important part of that transit.

WITNESS CASILLAS: So, let try and rephrase. You're saying the current standards today for the last, I would say the last ten years or so, I believe, the way that codes qualified is substantially different.

ADMINISTRATIVE JUDGE BARATTA: Yes.

WITNESS CASILLAS: Yes, that is -- I agree.

ADMINISTRATIVE JUDGE BARATTA: Do you agree with that statement?

WITNESS CASILLAS: Yes.

ADMINISTRATIVE JUDGE BARATTA: Okay.

ADMINISTRATIVE JUDGE RUBENSTEIN: I have a clarifying statement.

ADMINISTRATIVE JUDGE BARATTA: And I believe that that's the standard that we should apply here. So, we need to discuss that, testing the comparisons that were made for an MSIV closure, which I understand are proprietary section that we can discuss latter on.

WITNESS CASILLAS: Yes, that involves a departure from the licensing basis for the code. The basis --

ADMINISTRATIVE JUDGE BARATTA: The licensing basis I really, again, that's what the Staff did.

WITNESS CASILLAS: Yes, let me --

ADMINISTRATIVE JUDGE BARATTA: What you've got to do is convince me that this code is acceptable for what you used it.

WITNESS CASILLAS: Let me expand on that. There is basically two methods that were used to determine the -- well, let me say, the requirement is that the method in which the code will be applied in licensing must be conservative.

Now, whether that is done by extensive qualification or by simple demonstration of conservatism, is sufficient. So now, certainly all the models are reviewed and determined as to their accuracy and that there is phenomenon.

And so the process, there's two methods

that are applied in the proprietary information. And that has to do with assessing all of the uncertainties of all the physical correlations in determining what would be an upper bound prediction for that event or determining this empirical comparison.

ADMINISTRATIVE JUDGE BARATTA: Well, that's maybe what you did in the code manual, but that's not currently what people do. But we'll discuss that more later.

ADMINISTRATIVE JUDGE BARATTA: All right, okay.

ADMINISTRATIVE JUDGE RUBENSTEIN: Well, that leaves me with a -- you almost answered my clarifying question.

WITNESS CASILLAS: Okay.

ADMINISTRATIVE JUDGE RUBENSTEIN: But let me -- which was my last one. In justifying the way you've used the adjusted code or licensing code benchmark to Peach Bottom for regulatory purposes, is that what I heard?

WITNESS CASILLAS: Yes.

ADMINISTRATIVE JUDGE RUBENSTEIN: And did you use the adjusted code to compare the other plant's data from the unanticipated events, or did you use the more sophisticated best estimate version to get confidence in the code or to explain the behavior of the unplanned transient events of interest here in this hearing?

WITNESS CASILLAS: When you refer to other events, are those the other qualifications, the non-pressurization events?

ADMINISTRATIVE JUDGE RUBENSTEIN: Well, other than Peach Bottom?

WITNESS CASILLAS: Yes.

ADMINISTRATIVE JUDGE RUBENSTEIN: In offering experiential information to justify the wave, you talk about experience in a variety of similar U.S. plants, BWRs. Is this sort of a subjective discussion which says these are similar plants and we applied a code, the ODYN code to the results of the data we measured and it gave us good behavior?

So, when you did that with the best estimate code, was that with the adjusted code?

WITNESS CASILLAS: And this offers me also an opportunity to correct a previous statement from this morning --

ADMINISTRATIVE JUDGE RUBENSTEIN: Good.

WITNESS CASILLAS: -- as to the discussion was to how long ago we had actual tests. And, of course, tests come from plants that have been starting up.

And I stated that it was in the mid eighties, the latest plant. Actually, there were a few plants in the late eighties. And there was in fact another U.S. plant that started in '91 or '92 also.

So we have had more start ups in test now. All of the start ups have included large transient tests. And in the large transient tests there were predictions made as, well, your best estimate code and said this is where your peak pressure aught to be, this is what the prediction should be, and this is the uncertainty band that you should be at.

And all of those tests were successful. And this is all -- we haven't had --

ADMINISTRATIVE JUDGE RUBENSTEIN: They were successful in describing the behavior --

WITNESS CASILLAS: Criteria.

ADMINISTRATIVE JUDGE RUBENSTEIN: But, the code you used was the best estimate code, which was not an adjusted licensing code.

WITNESS CASILLAs: Correct.

ADMINISTRATIVE JUDGE RUBENSTEIN: Did you apply the adjusted licensing cod to those transients? And did they bound the data?

WITNESS CASILLAS: Yes, the licensing --

ADMINISTRATIVE JUDGE RUBENSTEIN: So, when we look in the licensing arena --

WITNESS CASILLAS: Right.

ADMINISTRATIVE JUDGE RUBENSTEIN: -- we find that the adjusted licensing code has more than bound the Peach Bottom data, it bounds other plants.

WITNESS CASILLAS: Correct, all the other startup plants.

ADMINISTRATIVE JUDGE RUBENSTEIN: All the other starting plants?

WITNESS CASILLAS: Correct, yes.

ADMINISTRATIVE JUDGE RUBENSTEIN: And this is like, when you say starting plants, it's like putting the Tennessee plants back on line and stuff like that?

WITNESS CASILLAS: Well, the tennessee plants go back to the seventies.

ADMINISTRATIVE JUDGE RUBENSTEIN: No, no, I meant one of them is coming back online.

WITNESS CASILLAS: Yes.

WITNESS NICHOLS: Brunswick One.

ADMINISTRATIVE JUDGE RUBENSTEIN: Yes.

WITNESS CASILLAS: Yes, that one is going through some testing. And so it will be -- it would be the same plant. But I don't believe that it has not started yet.

WITNESS NICHOLS: Has not.

WITNESS CASILLAS: It has not started yet, but it will start. But the other later plants that started in the early 90's and the late 80's, they all had to do and they all used the ODYN model with all it's simplifications.

ADMINISTRATIVE JUDGE RUBENSTEIN: Don't say the ODYN model, say the adjusted licensing ODYN model or the best estimate model.

WITNESS CASILLAS: The best estimate model to predict its expected behavior. And the adjusted model to determine the licensing basis.

ADMINISTRATIVE JUDGE RUBENSTEIN: Fine. I'm done.

CHAIR KARLIN: A couple of questions. And these are very basic. But I just -- and Mr. Casillas, on your testimony, you work for General Electric, right?

WITNESS CASILLAS: That is correct.

CHAIR KARLIN: You're a consultant for General Electric or you work for General Electric and you're consulting to assist Entergy on this matter.

WITNESS CASILLAS: Well no, not exactly.

CHAIR KARLIN: Okay.

WITNESS CASILLAS: Well, yes. My title is consulting engineer.

CHAIR KARLIN: Right consulting engineer.

WITNESS CASILLAS: Within the General Electric org. And I consult --

ADMINISTRATIVE JUDGE RUBENSTEIN: That's as opposed to engineer

WITNESS CASILLAS: Correct.

ADMINISTRATIVE JUDGE BARATTA: That's like --

CHAIR KARLIN: I understand.

ADMINISTRATIVE JUDGE RUBENSTEIN: That has to do with your --

CHAIR KARLIN: No, I just wanted to know. When you say we did a test at Peach Bottom, this is just sort of fundamental, you didn't do it. Were you there helping work on that?

WITNESS CASILLAS: No, the General Electric company.

CHAIR KARLIN: Okay, General Electric did.

WITNESS CASILLAS: Correct.

CHAIR KARLIN: And how do you -- and there was tests done in '91 and other times there were tests done?

WITNESS CASILLAS: Other --

CHAIR KARLIN: When you say these tests were done, you didn't do those tests, did you?

WITNESS CASILLAS: these tests were done by the utility with General Electric participation --

CHAIR KARLIN: Right.

WITNESS CASILLAS: -- and assistance.

CHAIR KARLIN: All right. Now tell me, which ones did you work on? Which large transient tests did you personally go there and work with?

WITNESS CASILLAS: Okay. I have worked for General Electric for over 30 years.

CHAIR KARLIN: Right.

WITNESS CASILLAS: And I have worked in all aspects of analytical planned performance. I have seen data. I have never run a test myself. I have seen and received data from all kinds of tests.

CHAIR KARLIN: So you get pieces of paper from somebody else?

WITNESS CASILLAS: I have received --

CHAIR KARLIN: And you read it?

WITNESS CASILLAS: -- a bunch of data, yes. And I run physics tests, I run accident tests, I've run transient tests.

CHAIR KARLIN: Okay. No, I mean, so that

when you say we did this and we did that, you're speaking generally of General Electric I guess.

WITNESS CASILLAS: General Electric, right.

CHAIR KARLIN: Or the license of some other company.

WITNESS CASILLAS: Our --

CHAIR KARLIN: You didn't do these.

WITNESS CASILLAS: Our engineering association, right.

CHAIR KARLIN: Okay. Do you have more questions?

ADMINISTRATIVE JUDGE RUBENSTEIN: Can I continue?

CHAIR KARLIN: Yes.

CHAIR KARLIN: Well, we've gone for an hour and 20 minutes -- an hour and ten minutes. So, we can either take a break or finish up and let these people, guys go. How much more time? Or you want to take a break?

ADMINISTRATIVE JUDGE RUBENSTEIN: Yes, let's take a break.

CHAIR KARLIN: All right, they need a break anyway. So a ten minute break. We will reconvene at ten of. Eight minute break.

(Whereupon, the above-entitled matter went off the record at 3:48 p.m. and went back on the record at 3:57 p.m.)

CHAIR KARLIN: Let's continue. I think we're maybe close to the end of your day. Judge Baratta?

ADMINISTRATIVE JUDGE BARATTA: Thank you. You mentioned earlier that -- and I believe it's on page 11, question number 28 -- that you made some changes to the condensate bleed system and that you chose to do testing in that case because of the magnitude of changes.

And what I'm -- I'm not questioning their decision there at all, okay. I'm trying to gauge. In one case you're saying you don't want to do testing or you don't think it's necessary.

In the other case you thought it was necessary. And I'm looking at the processes that went into that to try and understand what it is differentiated the two so that I can better understand your rationale to see whether or not I agree with this, okay.

And, for the Staff, I'm going to be asking you the same question, okay. So you might be thinking about it. And, similarly, for the intervener, I'd like your thoughts on it too.

A couple questions obviously come to mind. And I think I understand what the transient is, because you're now required in order to make a full power --

WITNESS CASILLAS: Correct.

ADMINISTRATIVE JUDGE BARATTA: And if you lose one of the three feed pumps, I think you said -- and correct me if I'm wrong. I just wanted to recap what you said.

You then are required to do a runback to a lower power level --

WITNESS NICHOLS: That is correct.

ADMINISTRATIVE JUDGE BARATTA: Because your two feed pumps are unable to supply something less than full power.

WITNESS NICHOLS: That is correct.

ADMINISTRATIVE JUDGE BARATTA: Okay. I gather that in coming to that decision you would've had to have looked at the same considerations that are in the SRP that were looked at for not doing the turbine trips and the MSIV closure, is that correct?

WITNESS NICHOLS: Similar.

ADMINISTRATIVE JUDGE BARATTA: Okay. Did you, for example, look at other plant experiences? I don't know whether anybody else has had to do that as a result.

WITNESS NICHOLS: Other plants made that modification.

ADMINISTRATIVE JUDGE BARATTA: And did they test or --

WITNESS NICHOLS: I don't believe those plants tested as part of their power assertion.

ADMINISTRATIVE JUDGE BARATTA: Okay. What about -- did they model it with ODYN or did you model it with ODYN?

WITNESS NICHOLS: No, we did not model it with ODYN.

ADMINISTRATIVE JUDGE BARATTA: Okay. Did you model it with any other code and see whether or not -- see what the outcome would be like?

WITNESS NICHOLS: Yes, we did model with a code called retran.

ADMINISTRATIVE JUDGE BARATTA: Okay. Did -- I think what the other -- oh, did you have anything in the Vermont Yankee experience that would lead you to be concerned about that transient that would say that, well you know, we really should do the test?

Because I think that those are kind of the factors that are coming into play here.

WITNESS NICHOLS: No, it was the fact that it was -- I want to call it a new phenomenon. But it was a new feature of the plant that was different than before, okay?

And, basically what would've happened if we had originally -- for our plant one of the features had been that we ran three feed pumps and three condensate pumps.

If that had been part of the original license thermal power, and that we would've had this runback, we would've tested it during original plant startup.

So, plants that have typically turbine driven feed pumps, have a runback feature. And that's tested during initial plant startup testing. Vermont Yankee did not have such a feature because we had this auto-swap feature, okay?

So, therefore, with the power uprate, we created the need for the feature or chose to install the features because the other option would've been not to run back in with the plant trip, which it would've done.

So it was an economic decision and a prudent decision to install the runback feature, okay? So that was a new feature for the power plant. And, in response to Staff's questions and finally in agreement under a license condition, we agreed to perform that test to satisfy a concern that they had about the trip, one, of a condensate pump not resulting necessarily in a plant trip, but resulting in a loss of feed water event.

Okay, because if you ended up with a suction pressure issue and tripped all three feed pumps, that would've been a concern. They put that criteria for the condensate pump and said, depending on the results of that test and in the analysis you do there of that, or perform a test of a feed pump trip and verify that the plant won't trip offline.

So we ended up running the condensate pump trip test, okay, and had internal criteria that under a condensate pump trip test that we not trip the plant offline, so a much more conservative criteria on our part.

And, in fact, when the plant transient occurred, were laid over the retran curve, they were essentially identical.

ADMINISTRATIVE JUDGE BARATTA: Why -- you heard Mr. Casillas say that ODYN is now considered suitable for handling other plant transients or all plant transients.

I forget how it was phrased in the testimony. Why did you choose to use ODYN instead of Retran?

WITNESS NICHOLS: We do the Retran model in house.

ADMINISTRATIVE JUDGE BARATTA: Okay.

WITNESS NICHOLS: That's something we did ourselves.

ADMINISTRATIVE JUDGE BARATTA: Okay. You say it's different, your situation now is different than it was before because you're running three versus two.

What differentiates that situation from the fact that before you had 100 percent steam dump capability or a turbine trip, and now you only have 90 percent?

Why aren't those two -- why is one different and one not in a way?

WITNESS NICHOLS: And we looked at exactly that type of criteria. It is a whole new feature or a whole new integrated system interaction between the condensate feed water, 4kV breaker tripping system, injecting signals to run back the pumps.

It initiates an automatic level setdown feature for reactor level. This is a very -- ended up doing perfectly during the test. But the concern was, given the so-called integrated effects, looking at the reduction in bypass capacity via the increase in steam flow, it really only affects one parameter.

How much steam is put to the condenser versus how much is creating pressurization effect. So it only affects one number, i.e. the amount of pressurization.

When that was run by General Electric using the ODYN code it was found not to be a significant factor. It did not create that we had to, in order to respond, we now needed to have HPCI start automatically under, you know, within three seconds.

It didn't create a whole new phenomenological factor.

ADMINISTRATIVE JUDGE BARATTA: So, in terms of the scale and complexity of one to ten you might say that the change associated with running three pumps and having to have a runback, etcetera, would be more like seven or eight.

And, in terms of the turbine trip, it's a one or two or three.

WITNESS NICHOLS: That would be a fair assessment.

ADMINISTRATIVE JUDGE BARATTA: Okay.

There's one other one I had too. Oh, yes. In doing an analysis using codes such as ODYN, Retran there's two aspects.

One is the code itself and the other one is the plant model, that is the input that is used to describe the real world. Could you briefly describe what efforts were done to qualify that model to confirm that it does capture the physical features of the plant that are important to modeling MSIV closure and a turbine trip?

In other words, how do I know that the results that ODYN's predicting are really based on a true representation of the plant?

WITNESS CASILLAS: Let me answer that. The safety analysis, the methods used to apply the best estimate ODYN model to licensing analysis includes -- is required to use the worst case equipment performance that the plant must meet through their surveillances.

And so, for example, when we talk about the control rods' insertion, we take the slowest that they are required to meet. When we use valve closure times we use the fastest that they can close.

So, in addition to what we have alluded to the method uncertainty correction of the results, we also have a very significant plant characteristics.

ADMINISTRATIVE JUDGE BARATTA: And I understand what you're saying.

WITNESS CASILLAS: Yes.

ADMINISTRATIVE JUDGE BARATTA: But that's not quite the question I'm asking either. I apologize if I wasn't clear. When one -- usually when one develops a plant model, I believe, most people would say that how do we know it really is this plant as opposed to some other plant?

So, what you do is you take maybe just normal operational transients, like increase the power and shutdown, things like that. And you use the code you're going to use and you apply them all and see how well does it match reality?

Okay, you're not trying to analyze the transient per say, that you're interested in at this point, you're just trying to verify and validate the plant input data to make sure that you haven't screwed up on some hydraulic diameter or something like that.

What was done to validate the input data, enhance the nodilization, etcetera, that represents Vermont Yankee?

WITNESS CASILLAS: We use design procedures and the verified inputs that reflect the characteristics of the plant. We put together the model in a fully Q/A process.

ADMINISTRATIVE JUDGE BARATTA: So there was no nodilization studies done. There were no plant cooperations done in which you verified?

WITNESS CASILLAS: The procedure tells us how to or nodilize where the nodes -- how big they need to be, how small, how many of them, what to take. There's almost no -- in fact, it's practically an automatic process.

We load all the data that's applicable to the plant from drawings to system settings, to set points, dimensions, everything, and press the button, and here comes our ODYN model.

There's no -- you don't need to fine tune it. You don't need to play with it.

ADMINISTRATIVE JUDGE BARATTA: And there was no assessment done as to whether or not it's right.

WITNESS CASILLAS: There is a verification of the model after the person that it's responsible for making the model then turns all his design records to an independent verifier.

And the designer has to run some stability tests, some model comparisons.

ADMINISTRATIVE JUDGE BARATTA: Well, that's what I'm asking.

WITNESS CASILLAS: Yes, there is a standard process.

ADMINISTRATIVE JUDGE BARATTA: Okay, what are those? Would you be more specific?

WITNESS CASILLAS: Well you determine a steady state condition. You compare it to the plant conditions. You compare some of the derivatives that come out of the plant.

There's several checklists that I run through that.

ADMINISTRATIVE JUDGE BARATTA: Have you done that yourself or --

WITNESS CASILLAS: I used to do that many years ago, yes.

ADMINISTRATIVE JUDGE BARATTA: All right. Does this include actually running plant transients? And I'm not talking necessarily abnormal ones. It could just be just normal startup and shutdown type of transients to confirm that the model performs as expected.

WITNESS CASILLAS: No.

ADMINISTRATIVE JUDGE BARATTA: Really?

WITNESS CASILLAS: No, no. The model, the procedure that is made to construct the model is based on the way that the model -- it's an integrated. Our technologists and our designers have a method by which they both say this is the way you apply and use the ODYN model.

And you must do it this way. They review the process and the designer reviews the process. They say this is the right way --

ADMINISTRATIVE JUDGE BARATTA: There's no testing of the end product though.

WITNESS CASILLAS: It is not -- the process indeed -- I think I know what you're getting at. When we first had -- the model was new. We had surprises and different things.

Some parts didn't work for everybody. And so, after a few applications, we learned what are all the important parts of the model and what needs to be controlled, what aspects, where tests need to be run to make sure that you have the right behavior.

And all of that is incorporated in design procedures and it's verified and qualified. And there's no need to re-invent the wheel, if you will.

ADMINISTRATIVE JUDGE BARATTA: Well, it's always good to check to make sure the parts --

WITNESS CASILLAS: It's always checked.

All the important checks are included in the design process.

ADMINISTRATIVE JUDGE BARATTA: I actually am well aware of your process. But I've always been skeptical of it. Shall we continue?

CHAIR KARLIN: Do you want to go to the Staff?

ADMINISTRATIVE JUDGE RUBENSTEIN: Two questions. And perhaps this is for Mr. Nichols. The MSIV large transient tests on Vermont Yankee, has one ever been performed?

WITNESS NICHOLS: It would've been done during original plant startup.

ADMINISTRATIVE JUDGE RUBENSTEIN: Okay. That's what I want to know. Was one performed then? I'm assuming it was.

WITNESS NICHOLS: Yes.

CHAIR KARLIN: But I would like to know the date and, you know, Mr. Casillas, if you know the answer to that.

WITNESS CASILLAS: I cannot answer positively.

CHAIR KARLIN: Well that's what I want. I want to know a fact.

WITNESS CASILLAS: I have seen most every report, startup report, and I've seen all those tests. And --

CHAIR KARLIN: Once in a while I like to know --

WITNESS CASILLAS: Yes.

CHAIR KARLIN: -- if something really happened. And I'll have the same question for the generator load rejection test. Was one ever performed at Vermont Yankee? And if so, what was the date?

WITNESS CASILLAS: I think that probably we should get back to you on those exact thing.

WITNESS NICHOLS: Yes. I know --

CHAIR KARLIN: Do you want to come back tomorrow.

WITNESS NICHOLS: Sure.

ADMINISTRATIVE JUDGE RUBENSTEIN: No, no, no.

WITNESS CASILLAS: There is startup reports.

CHAIR KARLIN: Okay, you don't have that readily at your fingertips.

WITNESS CASILLAS: We don't have it.

CHAIR KARLIN: Okay.

WITNESS NICHOLS: The actual reference to what power level they were done at, etcetera.

WITNESS CASILLAS: Yes.

CHAIR KARLIN: Well, it seems like that's an important thing. Yes, that was done, and it was done in --

WITNESS CASILLAS: And I would be surprised it would not have been done. But it's not something that is used.

CHAIR KARLIN: I'm just surprised you all don't know exactly when and where it was done. Okay. That's all I've got right now.

ADMINISTRATIVE JUDGE BARATTA: You've actually prompted me to ask another question.

CHAIR KARLIN: Yes, I thought you had a question.

ADMINISTRATIVE JUDGE BARATTA: Yes. I do recall reading something about that. And it seems to me that in one of the Exhibits -- and maybe this will jog your memory -- there was mention that at one time the plant was designed not to trip on turbine trip.

WITNESS NICHOLS: That is correct.

ADMINISTRATIVE JUDGE BARATTA: Okay. And that, during the original testing, something and it's not clear from the reference, something went wrong and the test was not completely satisfactorily, was the words I remember from the --

WITNESS NICHOLS: And I do recall those words as well. And it was something about the test was performed at about 93 percent of original power --

ADMINISTRATIVE JUDGE BARATTA: Right.

WITNESS NICHOLS: -- on one of those tests and a scram actually occurred prematurely. But, by the time they went to re-complete the test, the group's logic was defeated and so the test could not be repeated.

But I wan to clarify that to give you exactly which test we are referring to.

ADMINISTRATIVE JUDGE BARATTA: Okay. So you'll be able to do that tomorrow?

WITNESS NICHOLS: Yes, just not to my recollection.

ADMINISTRATIVE JUDGE BARATTA: All right. The other question I had -- and this may get into the proprietary. If it does we'll deal with it on Thursday.

I was confused in reading the constant pressure power uprate document. It appeared some tests were done generically or some transients were done generically.

Other ones are re-load specific. And it wasn't clear to me if either of these fall into the generic and which is the re-load.

WITNESS CASILLAS: The basis for not just the constant pressure power uprating, but in general for several modifications to the station, typically what would be done is an assessment would be made of the type of events that are affected by this change.

MR. TRAVIESO-DIAZ: Excuse me. I am advised that he may be getting into proprietary materials.

ADMINISTRATIVE JUDGE BARATTA: Okay, if that's the case I'll save it then. We'll discuss that then. I was afraid that might be the case.

CHAIR KARLIN: Do we have anymore questions for this panel at this time?

ADMINISTRATIVE JUDGE RUBENSTEIN: No.

ADMINISTRATIVE JUDGE BARATTA: No.

CHAIR KARLIN: Thank you very much. You may step down for the time being.

WITNESS NICHOLS: Thank you.

ADMINISTRATIVE JUDGE RUBENSTEIN: Thank you.

CHAIR KARLIN: Mr. Hamrick, Mr. Turk?

MR. HAMRICK: Yes.

CHAIR KARLIN: You're up.

MR. HAMRICK: One second.

CHAIR KARLIN: Your exhibits and your panel.

MR. TURK: Your Honor, just for clarification, you had mentioned there would be some process that we would break for ten or fifteen minutes to put together questions that we think we should ask.

CHAIR KARLIN: That will occur when all three are done. I'm sorry if I wasn't clear on that. What we'll do is we'll go through everyone once. This will give you probably until tomorrow, unless we go very late tonight, to come up with the questions that you might want to suggest.

MR. TURK: It may help, Your Honor, to save the record if you allow us maybe five or ten minutes to organize, hand the exhibits to the people who need them in the room.

And then we can get going and start quickly without -- until the record reopens. Can we take maybe five or ten minutes?

CHAIR KARLIN: You mean right now?

MR. TURK: Yes.

CHAIR KARLIN: What I'd like to do is ask you all to put your exhibits in as they get in if you could, and then just bring me witnesses up and let's go.

MR. TURK: Okay.

CHAIR KARLIN: WE're going to go to about six o'clock tonight. Our hope is to go to about six if that's all right.

MR. SHADIS: I'm sorry, I missed that.

CHAIR KARLIN: We intend to go to 6:00 p.m. this evening at least.

MR. TURK: Your Honor, we have with us extra copies of exhibits so that you would have those for your convenience with you. We'd like to hand those out.

CHAIR KARLIN: No, I don't think we need them, you know, unless there is some difference. They should be identical to what you had. So we have them in our possession and we don't need extras. We do the three.

(Pause.)

CHAIR KARLIN: Mr. Hamrick, are you ready to proceed.

MR. HAMRICK: Thank you, Your Honor. If I may?

CHAIR KARLIN: Could we have some quiet in the courtroom? We are proceeding. Please be seated.

MR. HAMRICK: We have marked for identification as NRC Staff Exhibit 1P a document entitled Safety Evaluation by the Office of Nuclear Reactor regulation related to amendment number 229, to facility operating license number DPR-28, Entergy Nuclear Vermont Yankee, L.L.C., and Entergy Nuclear Operations, Inc, Vermont Yankee Nuclear Power station, docket number 50-271, dated March 2nd, 2006.

This is the proprietary version of the Staff's safety evaluation.

CHAIR KARLIN: Exhibit 1P?

MR. HAMRICK: Exhibit 1P, correct.

(Whereupon, the above-referenced to document was marked as Staff Exhibit No. 1P for identification.)

MR. HAMRICK: What has been premarked for identification, as NRC Staff exhibit 2, is the safety evaluation by the office of nuclear reactor regulation, related to amendment number 229, to facility operating license number DPR-28, Entergy Nuclear Vermont Yankee, L.L.C, and Entergy Nuclear Operations Inc, Vermont Yankee Nuclear Power Station, docket number 50-271, dated March 2nd, 2006.

This is the non-proprietary version of the Staff's safety evaluation.

(Whereupon, the above-referenced to document was marked as Staff Exhibit No. 2 for identification.)

CHAIR KARLIN: All right.

MR. HAMRICK: NRC staff exhibit 3, which had been the letter from Graham Wallace, Chairman of the ACRS, has been withdrawn pursuant to the Board's order asking us not to duplicate exhibits that have been previously identified by Entergy. That is Entergy exhibit 22, for the record.

(Whereupon, the above-referenced to document was marked as Staff Exhibit No. 3 for identification, and was withdrawn.)

CHAIR KARLIN: Right.

CHAIR KARLIN: I just wanted to state that for the record.

NRC staff exhibit 4, what has been premarked as Staff exhibit 4, is the NRC regulatory guide, RG 1.68, initial test programs for water cooled nuclear power plants, revision 2, dated August 1978, and appendix A thereto.

(Whereupon, the above-referenced to document was marked as Staff Exhibit No. 4 for identification.)

MR. HAMRICK: What has been premarked as NRC Staff exhibit 5 is Office of Nuclear Reactor Regulation document entitled, Review Standard for Extended Power uprates, RS-001, revision 1, dated December 2003, identified and provided as Staff exhibit A on May 17th, 2006.

(Whereupon, the above-referenced to document was marked as Staff Exhibit No. 5 for identification.)

CHAIR KARLIN: I might just pause for a moment here. Ms. Carpentier, are you okay with the numbering?

One of the things I think we might ask the court reporter, we have a list that was prefiled of all of these documents, both from Entergy and the Staff. So I think if we give a copy to the court reporter it might help her with the transcription of this.

I think you have given her something. Is that the entire list?

MR. HAMRICK: I handed the court reporter the --

CHAIR KARLIN: That is your exhibit list, yes. Great, then that has been done. Good idea.

MR. HAMRICK: I believe I just identified exhibit 5.

Moving on, NRC Staff exhibits 6, 7, and 8, as identified previously, have also been withdrawn as they are the standard review plan, section 14.2.1, which is Entergy exhibit 4. Staff exhibit 7 was from Entergy's exhibit number 5, the attachment 7 to its application. NRC Staff exhibit 8, which is also withdrawn, is Entergy exhibit 6, supplement number three to the EPU application, dated October 28th, 2003.

(Whereupon, the above-referenced to documents were marked as Staff Exhibit Nos. 6, 7 and 8 for identification, and were withdrawn.)

MR. HAMRICK: And what has been premarked for identification as NRC Staff exhibit 9, is a letter from J. K. Thayer, of Entergy, to the NRC document control desk, transmitting supplement number 23 to Entergy's EPU application, entitled response to request for additional information, dated February 24th, 2005, it is a partial document.

(Whereupon, the above-referenced to document was marked as Staff Exhibit No. 9 for identification.)

MR. HAMRICK: What has been premarked for identification as NRC Staff exhibit 10 is a letter from J. Kay Thayer of Entergy, to the NRC document control desk, transmitting supplement number 28 to Entergy's EPU application, entitled response to request for additional information, dated April 22nd, 2005. Again, a partial document.

(Whereupon, the above-referenced to document was marked as Staff Exhibit No. 10 for identification.)

MR. TURK: May we pause and go off the record, Your Honor?

CHAIR KARLIN: Yes.

(Whereupon, the above-entitled matter

went off the record at 4:24 p.m. and went back on the record at 4:25 p.m.)

CHAIR KARLIN: Ms. Carpentier do you have number 9? Or are we on ten now? Where are we. That was ten.

MR. HAMRICK: We are onto what has been premarked for identification as NRC Staff exhibit 11, a letter from Robert J. Wancyk of Entergy, to NRC document control desk, transmitting supplement number 30 to Entergy's EPU application, entitled response to request for additional information, dated August 1st, 2005. This is, again, a partial document, attachment 8.

(Whereupon, the above-referenced to document was marked as Staff Exhibit No. 11 for identification.)

MR. HAMRICK: What has been premarked for identification as NRC Staff exhibit 12 has been withdrawn, as it is Entergy exhibit 25. This is the GE topical report for the CPPU uprate, topical.

(Whereupon, the above-referenced to document was marked as Staff Exhibit No. 12

for identification, and was withdrawn.)

MR. HAMRICK: What has been premarked for identification as NRC Staff exhibit 13 has been withdrawn. This is the letter from William H. Ruland, of the NRC, transmitting the safety evaluation for the GE nuclear licensing topical report for the CPPU. This document is included on pages 3 through 87 of Entergy exhibit 25.

(Whereupon, the above-referenced to document was marked as Staff Exhibit No. 13 for identification, and was withdrawn.)

MR. HAMRICK: What has been premarked as NRC Staff exhibit 14 is also withdrawn. This is the proprietary version of the same letter from William H. Ruland transmitting this safety evaluation for the CPPU topical report. This is also included in pages 3 to 87 of Entergy exhibit 30P.

(Whereupon, the above-referenced to document was marked as Staff Exhibit No. 14 for identification, and was withdrawn.)

MR. HAMRICK: What has been premarked for identification as NRC Staff exhibit 15 is withdrawn. This is a letter from Robert Tedesco of the NRC, closing the safety evaluation for ODYN, dated June 1980. This is included in pages 4 through 109 of Entergy exhibit 26, the topical report for ODYN. Entergy exhibit 26P, thank you.

(Whereupon, the above-referenced to document was marked as Staff Exhibit No. 15 for identification and was withdrawn.)

MR. HAMRICK: What has been premarked, for identification, as NRC Staff exhibit 16 is also withdrawn. This is the supplemental safety evaluation for the ODYN topical report. This is also included in Entergy exhibit 26P, on pages 110 to 125.

(Whereupon, the above-referenced to document was marked as Staff Exhibit No. 16 for identification and was withdrawn.)

MR. HAMRICK: And what has been premarked for identification as NRC Staff exhibit 17, a letter from Cecil O. Thomas, NRC, to J.S. Charnley, General

Electric Company, dated November 5th, 1985, entitled acceptance for referencing of licensing topical report, NEDE-240111-P-A, rev 6, amendment 11, General Electric Standard Application for Reactor Fuel, G star 2.

(Whereupon, the above-referenced to document was marked as Staff Exhibit No. 17 for identification.)

MR. HAMRICK: This document has not been withdrawn.

CHAIR KARLIN: I'm sorry?

MR. HAMRICK: That document has not been withdrawn, has been introduced.

CHAIR KARLIN: Right, that is 17?

MR. HAMRICK: Yes, 17. What has been premarked as NRC Staff exhibit 18 is a letter from Gus C. Lainas of the NRC, to J.S. Charnley of General Electric company, dated March 22nd, 1986, entitled acceptance for referencing of licensing topical report, NEDE-24-011-P-A, GE generic licensing reload report, supplement to amendment 11.

(Whereupon, the above-referenced to document was marked as Staff Exhibit No. 18

for identification.)

MR. HAMRICK: Your indulgence, Your Honor?

CHAIR KARLIN: Yes.

(Pause.)

MR. HAMRICK: And what has been premarked for identification as NRC Staff exhibit 19, a letter from R. M. Krich of Exelon Generation Company, L.L.C, to NRC, entitled Additional Testing Information supporting the license amendment request to permit uprated power operaTion at Dresden Nuclear Power Station, and Quad Cities Nuclear Power Station, RS-01-104, dated May 18th, 2001.

(Whereupon, the above-referenced to document was marked as Staff Exhibit No. 19 for identification.)

MR. HAMRICK: And what has been identified as NRC Staff exhibit 20, entitled Safety Evaluation by the Office of NRR Related to Amendment Number 191 to Facility Operating License Number DPR-19, and Amendment Number 185, to Facility Operating License number DPR-25, Exelon Generation Company, L.L.C. Dresden Nuclear Power Station Units 2 and 3, dockets

50-237 and 50-249, dated December 21st, 2001. This is a partial document.

(Whereupon, the above-referenced to document was marked as Staff Exhibit No. 20 for identification.)

MR. HAMRICK: What has been premarked for identification as NRC Staff exhibit 21, is a -- has been withdrawn, as it has been previously identified and introduced as Entergy exhibit 33P, the proprietary version of the ODYN benchmark of the Dresden 3, January 30, 2004, turbine trip event.

(Whereupon, the above-referenced to document was marked as Staff Exhibit No. 21 for identification and was withdrawn.)

MR. HAMRICK: The NRC Staff has also identified documents dated -- marked documents NRC Staff 22 through 30 related to Contention 4, which it also withdraws.

(Whereupon, the above-referenced to documents were marked as Staff Exhibit Nos. 22- 30 for identification and were withdrawn.)

MR. HAMRICK: And documents 31 and 32, which the Board has already denied admission.

(Whereupon, the above-referenced to document was marked as Staff Exhibit Nos. 31 and 32 for identification and were rejected.)

MR. HAMRICK: So with that I hereby move for admission of the afore-introduced documents.

CHAIR KARLIN: All right. Any objections?

(No response.)

CHAIR KARLIN: Hearing none they shall be admitted into evidence.

(The document referred to, having been previously marked for identification as Staff Exhibit Nos. 1, 2, 4, 5, 9, 10, 11, 17-20 were received in evidence.)

CHAIR KARLIN: Okay. Didn't have quite as many as Entergy did. Now, if you could, we'll hear from your witnesses.

MR. HAMRICK: Certainly. The NRC Staff calls its panel of witnesses. Richard B. Ennis, Steven R. Jones, Robert L. Pettis, Junior, George Thomas and Zena Abdullahi.

CHAIR KARLIN: And perhaps they could sit in that order, if you would.

MR. HAMRICK: Okay.

CHAIR KARLIN: The order that you just called.

MR. HAMRICK: Sure.

(Pause.)

Whereupon,

RICHARD B. ENNIS

STEVEN R. JONES

ROBERT L. PETTIS, JR.

GEORGE THOMAS

ZENA ABDULLAHI

were called as witness by Counsel for the Staff and, having been duly sworn, assumed the witness stand, were examined and testified as follows:

MR. HAMRICK: I'm going to ask a few questions and ask that you answer sequentially so that everyone has a chance to answer. We can go down the row. Did you prepare written testimony for filing in this proceeding?

WITNESS JONES: Yes.

WITNESS ABDULLAHI: Yes.

MR. HAMRICK: Please, one at a time so that we can.

WITNESS ENNIS: Yes.

WITNESS JONES: Yes.

WITNESS PETTIS: Yes.

WITNESS THOMAS: Yes.

WITNESS ABDULLAHI: Yes.

MR. HAMRICK: Do you have before you a document entitled NRC Staff Testimony of Richard B. Ennis, Steve Jones, Robert L. Pettis, Junior, George Thomas and Zena Abdullahi concerning NEC Contention Three dated May 17, 2006 as revised September 8, 2006?

WITNESS ENNIS: I do.

WITNESS JONES: I do.

WITNESS PETTIS: I do.

WITNESS THOMAS: I do.

WITNESS ABDULLAHI: I do.

MR. HAMRICK: Have you prepared a statement of your professional qualifications?

WITNESS ENNIS: Yes.

WITNESS JONES: Yes.

WITNESS PETTIS: Yes.

WITNESS THOMAS: Yes.

WITNESS ABDULLAHI: Yes.

MR. HAMRICK: Is your statement of professional qualifications attached to your pre-filed testimony in this proceeding?

WITNESS ENNIS: Yes.

WITNESS JONES: Yes.

WITNESS PETTIS: Yes.

WITNESS THOMAS: Yes.

WITNESS ABDULLAHI: Yes.

MR. HAMRICK: Do you have any corrections, revisions, additions or deletions that you wish to make at this time?

WITNESS ENNIS: No.

WITNESS JONES: No.

WITNESS PETTIS: No.

WITNESS THOMAS: No.

WITNESS ABDULLAHI: No.

MR. HAMRICK: Other than the corrections on the errata sheet that has been produced to the Board and parties previously this morning?

WITNESS ENNIS: No.

WITNESS JONES: No.

WITNESS PETTIS: No.

WITNESS THOMAS: No.

WITNESS ABDULLAHI: No.

MR. HAMRICK: Do you adopt to your written --

CHAIR KARLIN: Mr. Jones, did you answer?

WITNESS JONES: Yes, I did. But my answer was no.

CHAIR KARLIN: Okay. I just didn't hear you.

WITNESS JONES: Sorry.

MR. HAMRICK: Do you adopt your written testimony as now revised as your sworn testimony in this proceeding?

WITNESS ENNIS: Yes.

WITNESS JONES: Yes.

WITNESS PETTIS: Yes.

WITNESS THOMAS: Yes.

WITNESS ABDULLAHI: Yes.

MR. HAMRICK: No further questions. I now move, if I may, I now move that the written testimony as revised dated September 8th, 2006 be admitted and put into the record as though it were read out loud.

CHAIR KARLIN: All right.

MR. SHADIS: We have an objection, Your

Honor.

CHAIR KARLIN: All right, please address that.

MR. SHADIS: Thank you. NRC Staff testimony was amended on page 11. The initial testimony referred to draft guidance for review of extended power uprate. And NRC Staff --

CHAIR KARLIN: Could you -- which line are we talking about on page 11?

MR. SHADIS: It is line 24 and 26. But the addition is actually a footnote, footnote seven at the bottom of the page.

CHAIR KARLIN: All right.

MR. SHADIS: And this is referenced on page two of Appendix A, the errata Staff testimony.

CHAIR KARLIN: Okay.

MR. SHADIS: Our problem here is that the Staff has introduced information that could be taken as some additional validation of the Staff's positions as they are outlined in the draft guidance.

And it is in our view essentially trying to introduce new argument into the written testimony, the new argument being that after long consideration the Staff has now re-affirmed their positions or possibly even changed.

We haven't had an opportunity to review this document. But, it does put us at a disadvantage. And I will say that, had we ever considered that the Board would permit such amendments to the filings, then we might well have taken the position of NRC Staff that new information, that is relevant information, is important to the Board and therefore should be admitted at basically any old time, including the first day of hearing.

An example of that would be that we've had discussion today with respect to the reliability of various components at Vermont Yankee. They issued an LER two weeks ago, inoperability on the high pressure coolant injection system because of a failed safety feature.

We're not trying to introduce it. I'm using that by way of example to say only that, in terms of just basic fairness, had we any inkling that, you know, late coming information that isn't necessarily extraordinary, but late coming information like this might be entertained, we too would've amended our testimony.

So, with that, I think in essence it is a done deal. They have put this document before the Board. I don't know how the Board can unconsider the statement that's implied. However, I would move that this be struck.

CHAIR KARLIN: Well, okay. Let me -- we understand that you can't unring the bell or direct the Jury to disregard what they just heard this witness say.

I don't think that's what's happening here. I don't know. I mean, this is the only concern you have, is this particular footnote? I mean --

MR. SHADIS: Yes, this is the only --

CHAIR KARLIN: There's a number of other things in here. I just wanted to know that that's the focus and concern. I'm looking at the text. And I'm going to ask Mr. Hamrick to respond so we can hear his response to this.

But let me just probe your question. On page 11, one, two, three, four lines down, they have footnote seven. Nothing has changed in the text.

MR. SHADIS: Yes, sir.

CHAIR KARLIN: They have added this footnote, which I guess wasn't there before. That's the implication. And it refers to some generic guidance, which is Exhibit 4.

And then it says the draft guidance was superseded in August of '06, see note five. How is that -- I mean, I don't think they're trying to slip anything in here.

How is it harmful or relevant. I'm not, you know, is there a problem? What's the problem?

MR. SHADIS: Well, this document was added to the electronic hearing docket list. It may or may not be material. I don't know what the probative value of it may be.

But, it is in essence being put before the Board that this document exists. There is the implication in it of NRC Staff's reaffirmation of its draft. And all this is argumentation.

CHAIR KARLIN: Well, let me ask Mr. Hamrick. Is this document at issue in August of '06, is that available to the public?

MR. TURK: May I address it, Your Honor?

CHAIR KARLIN: Yes.

MR. TURK: It is available to the public. As Mr. Shadis mentioned, we put it in the hearing file.

CHAIR KARLIN: Okay, that's my next question.

MR. TURK: On the website. In fact, what we did, by inserting things into the testimony, is simply recording a historical fact. The NRC has issued the guidance.

If the Staff was not to inform you of that, we might be accused of concealing information. So we provided you the information. We're neither arguing its relevance or arguing that you should consider it in your decision for any substantive or its merits.

We're simply reporting the historical fact. The witnesses have noted it for your attention. And we're leaving it there.

CHAIR KARLIN: Okay. Let me consult.

(Pause.)

CHAIR KARLIN: I think we do not expect the case to pivot on this point. And so I think what we're just going to do is deny that motion and allow this testimony to be in.

I think it's a correction that we probably would've been concerned about if somebody hadn't told us about it. And it's not offered as evidence. So we deny the motion and allow the testimony. So the testimony is admitted.

(Whereupon, the prefiled direct testimony of Richard B. Ennis, Steven R. Jones, Robert L. Pettis, George Thomas, and Zena Abdullahi was bound into the record as if having been read.)

May 17, 2006
As Revised 09/08/06

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
ENTERGY NUCLEAR VERMONT YANKEE, LLC and ENTERGY NUCLEAR OPERATIONS, INC.	)))	Docket No. 50-271-OLA ASLBP No. 04-832-02-OLA
	)	
(Vermont Yankee Nuclear Power Station)	)	

NRC STAFF TESTIMONY OF RICHARD B. ENNIS,
STEVEN R. JONES, ROBERT L. PETTIS JR.,
GEORGE THOMAS, AND ZEYNAB ABDULLAHI
CONCERNING NEC CONTENTION 3

Q1. Please state your names, occupations, and by whom you are employed.

A1(a). My name is Richard B. Ennis (RBE).[1] I am employed by the U.S. Nuclear Regulatory Commission ("NRC" or "Commission") as a Senior Project Manager in the Division of Operating Reactor Licensing, Office of Nuclear Reactor Regulation ("NRR"), in Rockville, MD. A statement of my professional qualifications is attached hereto.

A1(b). My name is Steven R. Jones (SRJ). I am employed by the NRC as a Senior Reactor Systems Engineer in the Division of Systems Safety, NRR, in Rockville, MD. A statement of my professional qualifications is attached hereto.

A1(c). My name is Robert L. Pettis, Jr. (RLP). I am employed by the NRC as a Senior Reactor Engineer in the Division of Engineering, NRR, in Rockville, MD. A statement of my professional qualifications is attached hereto.

[1] In this testimony, the sponsor of each numbered paragraph is identified by his or her initials; no such designation is provided for paragraphs that are sponsored by all witnesses.

A1(d). My name is George Thomas (GT). I am employed by the NRC as a Senior Reactor Systems Engineer in the Division of Safety Systems, NRR, in Rockville, MD. A statement of my professional qualifications is attached hereto.

A1(e). My name is Zeynab Abdullahi (ZA). I am employed by the NRC as a Senior Reactor Systems Engineer in the Division of Safety Systems, NRR, in Rockville, MD. A statement of my professional qualifications is attached hereto.

Q2. Please describe your current responsibilities.

A2(a). (RBE) I currently serve as the Senior Project Manager for the NRC Staff ("Staff"), concerning the extended power uprate ("EPU") license amendment for the Vermont Yankee Nuclear Power Station ("Vermont Yankee" or "VYNPS"). I am currently responsible for NRC headquarters coordination and communication of technical issues related to the Vermont Yankee EPU.

A2(b). (SRJ) I am responsible for evaluating the functional requirements, design, and performance of auxiliary, support and balance of plant systems (main steam and turbine, feedwater and condensate, diesel generator support, auxiliary feedwater, spent fuel pool cooling, circulating water, open and closed cycle cooling water, and reactor coolant leakage detection systems) for both current and planned nuclear plants. I also evaluate design features and methods for protection of essential systems and components from the effects of internal and external flooding, internally and externally generated missiles, and postulated pipe breaks outside containment. In addition to evaluating licensing actions, I provide technical expertise for inspections, operational event reviews, and policy activities in the assigned areas of review responsibility.

A2(c). (RLP) I am currently responsible for the technical review of several EPU and license renewal amendment requests. As part of my responsibilities, I have been responsible for evaluating the power ascension and testing plan section of the Vermont Yankee EPU application.

A2(d). (GT) I am currently responsible for reviewing and evaluating design, process design parameters, and performance of reactor thermal-hydraulic systems for boiling water reactor ("BWR") designs, including advanced reactor designs and combined operating licenses associated with the reactor coolant system and normal and emergency core cooling systems under steady-state, transient, and accident conditions. I am also responsible for reviewing the analysis of anticipated operational occurrences, postulated accidents, and actual operating experience from the viewpoint of systems operation and transient dynamics. My duties also include reviews and evaluations of the effects of changes to licensed thermal power, license renewal, and other technical specification changes related to BWR reactor systems.

A2(e). (ZA) I am currently responsible for evaluating the technical merit of applications requesting changes to the operation of nuclear power plants, regarding the impacts of the proposed changes on reactor response during steady state, transient and accident conditions. My areas of responsibilities include evaluating design basis safety analyses supporting BWR plants' operation (*e.g.*, reactor fuel and core performance, transients, emergency core cooling system ("ECCS") loss of coolant accidents ("LOCAs"), and instabilities), the capabilities of reactor safety coolant systems (*e.g.*, ECCS, reactor core isolation cooling ("RCIC")) to perform their safety functions, and the adequacy of nuclear monitoring and safety system actuation and trip setpoints during steady state, transient and accident conditions.

Q3. Please explain what your duties have been in connection with the NRC Staff's review of the application of Entergy Nuclear Vermont Yankee, LLC and Entergy Nuclear Operations, Inc. (collectively, "Entergy" or "Applicant") for an EPU license amendment for Vermont Yankee.

A3(a). (RBE) As part of my official responsibilities as the Senior Project Manager for the Staff's review of the Vermont Yankee EPU, I was the principal point of contact for NRR activities related to the EPU amendment. In addition, I coordinated the Staff's evaluation of the Vermont Yankee EPU and assisted in preparation of the Staff's draft Safety Evaluation for the EPU application ("Draft SE"), issued to the Advisory Committee on Reactor Safeguards ("ACRS") in October 2005 (Revision 0), and to the public in November 2005 (Revision 1); and I coordinated the Staff's preparation of the Final Safety Evaluation for the EPU application ("Final SE"), issued on March 2, 2006.[2]

A3(b). (SRJ) As part of my official responsibilities, I supervised the Staff's safety review of mechanical systems other than those directly associated with the nuclear steam supply system (*i.e.*, "Balance-of-Plant" systems) related to the Vermont Yankee EPU application; these include the condensate, feedwater, main steam, main turbine, and turbine bypass systems that are involved in the plant's response to transients. My supervisory role included verifying that the Staff developed safety conclusions which were adequately supported by the Applicant's responses to Staff requests for additional information and the Staff's technical evaluation of the effects of the proposed EPU on Balance-of-Plant systems. These technical reviews are described in Sections 2.5 and 2.12 of the Staff's Draft SE and Final SE.

A3(c). (RLP) As part of my official responsibilities, I coordinated the NRC Staff's review of the overall power uprate testing program of the Vermont Yankee EPU application, including preparation of Section 2.12 in the Staff's Draft SE and Final SE.

[2] *See* "Safety Evaluation by the Office of Nuclear Reactor Regulation Related to Amendment No. 229 to Facility Operating License No. DPR-28, Entergy Nuclear Vermont Yankee, LLC and Entergy Nuclear Operations, Inc., Vermont Yankee Nuclear Power Station, Docket No. 50-271," (Mar. 2, 2006) [Staff Exhibits 1 and 2].

A3(d). (GT) As part of my official responsibilities, I conducted the reactor systems review of the transient analyses submitted by the Applicant for the Vermont Yankee EPU, including preparation of Section 2.8.5 in the Staff's Draft SE and Final SE.

A3(e). (ZA)) As part of my official responsibilities, I conducted the Staff's review of the analytical methods used in the Vermont Yankee EPU application to perform the reactor neutronic and thermal/hydraulic analyses. This review is discussed in Section 2.8.7 in the Staff's Draft SE and Final SE.

Q4. What is the purpose of this testimony?

A4. The purpose of this testimony is to provide the NRC Staff's views with respect to NEC Contention 3, challenging the Applicant's justification for not performing large transient testing as a condition of the EPU license amendment.

Q5. Are you familiar with NEC Contention 3?

A5. (RBE, RLP, GT, SRJ) Yes. As admitted by the Licensing Board's Memorandum and Order of November 22, 2004, NEC Contention 3, states as follows:

> **NEC Contention 3**
> The license amendment should not be approved unless Large Transient Testing is a condition of the Extended Power Uprate.

Further, we have reviewed the Declaration of Arnold Gundersen ("Gundersen Declaration") filed in support of this contention as part of NEC's Request for Hearing dated August 30, 2004. As discussed in the Licensing Board's Memorandum and Order of April 17, 2006, we understand that two tests, the main steam isolation valve ("MSIV") closure test and the generator load rejection test, are embraced within the scope of this contention.

Q6. Please identify the bases alleged by Mr. Gundersen in his Declaration filed in support of this contention.

A6. (RBE, RLP, GT, SRJ) Mr. Gundersen asserted that the Applicant's plan to not perform large transient testing at EPU conditions "cannot be justified as good engineering practice nor is it in accord with Staff positions interpreting NRC regulation." Gundersen Declaration at 3. He also states that he "disagee[s] with and dispute[s] the assumptions and reasoning Entergy musters" to support not performing large transient testing. *Id.* Specifically, Mr. Gundersen took issue with certain statements made in Attachment 7 to the EPU application, entitled "Justification for Exception to Large Transient Testing." [Entergy Exhibit 5]. As we understand his concerns, Mr. Gundersen asserted, in essence, that: (1) the Applicant's citation of operational experience in the nuclear industry does not justify taking an exception to performing large transient testing for Vermont Yankee at EPU conditions; (2) Vermont Yankee's own experience with generator load rejections at 100% of the original licensed power level does not demonstrate that there will be adequate plant performance during transients at EPU conditions; and (3) periodic testing of systems, structures, and components ("SSCs"), during steady-state plant operation, does not confirm performance characteristics of the SSCs required for appropriate transient response. Gundersen Declaration at 4-5.

In addition, Mr. Gundersen asserted that "Entergy ignores the NRC Staff's decision in the case of the Duane Arnold EPU application." Gundersen Declaration at 4. In particular, the declaration quotes from an NRC request for additional information, dated May 9, 2001, to the Duane Arnold licensee which states, in part, that:

> The NRC-approved ELTR-1 [General Electric Licensing Topical Report NEDC-32424P-A, "Generic Guidelines for General Electric Boiling Water Reactor Extended Power Uprate" (ELTR1), dated February 1999] requires the MSIVC [main steam isolation valve closure] test to be performed if the power uprate is more than 10% above previously recorded MSIV closure transient data. The topical report also requires the GLR [generator load rejection] test to be performed if the uprate is more than 15% of previously recorded data.

Q7. Did you review other information submitted by NEC pertaining to this contention, in addition to Mr. Gundersen's Declaration?

A7. (RBE, RLP, GT, SRJ) Yes. We also reviewed NEC's Answer to the Applicant's Motion for Summary Disposition, dated December 26, 2005; and NEC's Answer to Entergy's Statement of Material Facts Regarding NEC Contention 3, dated December 22, 2005, including the Declaration of Dr. Joram Hopenfeld.

Q8. Please identify the Commission's requirements and guidance pertaining to whether large transient testing is required or should be performed to support plant operations at EPU conditions.

A8. (RLP, SRJ) Testing requirements are derived from 10 C.F.R. § 50.34(b)(6)(iii) and the quality assurance program that is incorporated into the operating license for each reactor pursuant to 10 C.F.R. § 50.34(b)(6)(ii) and implemented pursuant to 10 C.F.R. § 50.54(a). In accordance with 10 C.F.R. Part 50, Appendix B, Criterion XI, the quality assurance program must include a test program to assure that testing necessary to provide reasonable assurance that SSCs (defined in the Introduction to Appendix B) will perform satisfactorily in service, is identified and performed.

Most necessary testing is performed at the component or system level, but initial test programs include integrated transient tests. Commission guidance for initial plant testing is discussed in NRC Regulatory Guide ("RG") 1.68, "Initial Test Programs for Water-Cooled Nuclear Power Plants," Revision 2, dated August 1978 [Staff Exhibit 4]. The RG describes the general scope and depth of initial test programs that the NRC Staff has found acceptable during the review of initial operating license applications. Appendix A of RG 1.68 describes a set of tests acceptable to demonstrate that the plant will operate in accordance with design specifications both during normal steady-state conditions and, to the extent practical, during and following anticipated operational occurrences, such as MSIV closure and generator load rejection tests.

NRC regulatory guidance for EPUs is contained in RS-001, "Review Standard for Extended Power Uprates,"[3] which was developed primarily to increase the standardization and effectiveness of EPU reviews performed by the NRC Staff. This review standard provides the Staff's reviewers with references to existing review criteria (*i.e.*, applicable Standard Review Plan ("SRP") sections, branch technical positions, information notices and bulletins, generic letters, NUREGs, industry standards, applicable generic topical reports, etc.), and includes a template safety evaluation. Safety evaluation template Section 2.12, "Power Ascension and Testing Plan," indicates that the NRC's acceptance criteria for a proposed EPU test program are based on the requirements of 10 C.F.R. Part 50, Appendix B, Criterion XI.

As indicated in RS-001, Matrix 12, specific review criteria and NRC Staff guidance for assessing the extent of testing necessary for EPU applications is described in NUREG-0800,[4] SRP Section 14.2.1, "Generic Guidelines for Extended Power Uprate Testing Programs," Draft Revision 0, dated December 2002.[5] Subsection III.A, "Review Procedures," of SRP Section 14.2.1, provides procedures for a comparison of the proposed EPU test program to the initial plant test program. Subsection III.B provides procedures for a review of EPU post-modification testing requirements. Attachment 2 to SRP Section 14.2.1 provides a generic listing of transient tests drawn from RG 1.68 that are typically included in initial plant test programs that may be affected by modifications associated with an EPU. The two large transient tests that are the subject of this contention, MSIV closure and generator load rejection, are included in Attachment 2 and are listed therein as "Dynamic Response of Plant for Full Load Rejection,"

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[3] Office of Nuclear Reactor Regulation, "Review Standard for Extended Power Uprates," RS-001, Rev. 1 (Dec. 2003) (ADAMS Accession No. ML033640024) [Staff Exhibit 5].

[4] Office of Nuclear Reactor Regulation, NRC, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants," NUREG-0800.

[5] NUREG-0800, Section 14.2.1, Draft Revision 0 (Dec. 2002) [Entergy Exhibit 4]. The draft guidance was superseded by the issuance of NUREG-0800, Section 14.2.1 ("Generic Guidelines for Extended Power Uprate Testing Programs"), in August 2006 (ADAMS Accession No. ML062210398).

and "Dynamic Response of Plant to Automatic Closure of All Main Steam Isolation Valves," respectively.

Under SRP Section 14.2.1, licensees may propose an EPU test program that does not include all of the power ascension testing (including large transient testing) that would be identified by application of the review procedures in Subsections III.A and III.B of SRP Section 14.2.1. Subsection III.C of Section 14.2.1, "Use of Evaluation to Justify Elimination," provides for such proposals and lists the following factors to be considered when assessing the adequacy of the licensee's justification:

- previous operating experience;
- introduction of new thermal-hydraulic phenomena or identified system interactions;
- facility conformance to limitations associated with analytical analysis methods;
- plant staff familiarization with facility operation and trial use of operating and emergency operating procedures;
- margin reduction in safety analysis results for Anticipated Operational Occurrences;
- guidance contained in vendor topical reports; and
- risk implications.

SRP Section 14.2.1, at 7-10.

Q9. Please identify any previous NRC accepted Staff positions or guidance for EPUs relative to large transient testing for boiling water reactors.

A9 (RBE, RLP, GT, SRJ) The NRC Staff has approved General Electric Licensing Topical Report ELTR-1, "Generic Guidelines for General Electric Boiling Water Reactor Extended Power Uprate"; following NRC approval, ELTR-1 was issued in February 1999. Topical report ELTR-1 provides generic guidelines for BWR EPUs. Section 5.11.9 and Appendix L.2.4 of ELTR-1 state that: (1) a MSIV closure test, equivalent to that conducted in the initial startup testing, will be performed if the power uprate is more than 10% above any previously recorded MSIV closure data; and (2) for uprates of more than 15%, a generator load rejection test, equivalent to that conducted in the initial startup testing, will be performed if the power uprate is more than 15% above any previously recorded generator load rejection transient data.

The approach described in ELTR-1 was based on the assumption that the maximum reactor operating pressure would be increased under EPU conditions. GE subsequently developed a different approach to uprating reactor power in BWRs that does not increase the maximum reactor operating pressure. This approach, which is the basis for the Vermont Yankee EPU, is described in GE Licensing Topical Report NEDC-3300P-A, Revision 4, dated July 2003, "Constant Pressure Power Uprate ["CPPU"]" [Entergy Exhibits 25 and 30].

The NRC Staff has reviewed and approved the CPPU topical report, as described in a Safety Evaluation ("CPPU SE") dated March 31, 2003.[6] As discussed in Section 10.5.2 of that SE, in the CPPU topical report, GE proposed that large transient tests (MSIV closure and generator load rejection) included in topical report ELTR-1 not be performed for CPPU type uprates. GE provided a generic justification for not performing these tests and concluded that they are not needed to demonstrate the safety of plants implementing a CPPU. In evaluating GE's generic justification to not perform the two large transient tests, the Staff considered: (1) the modifications made to the plant for a CPPU that are related to the two tests; (2) component and system level testing that will be performed either as part of the licensee's power ascension and test plan or to meet technical specification surveillance requirements; (3) past experience at other plants; and (4) the importance of the additional information that could be obtained from performing the two tests with respect to plant analyses. The conclusions in the Staff's CPPU SE Section 10.5.9 stated, in part, that the Staff has previously

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[6] *See* "Safety Evaluation by the Office of Nuclear Reactor Regulation, GE Nuclear Energy Licensing Topical Report, NEDC-33004P, Revision 1" (March 31, 2003). Sections 3.4 and 10.5 of this SE are provided as Entergy Exhibit 30 (pages 35-36, 76-82), and Entergy Exhibit 25 (pages 35-36, 76-82).

accepted not performing large transient tests on a plant-specific basis and that the Staff was developing guidance to generically address the requirement for conducting large transients tests in conjunction with power uprates.[7] Therefore, the Staff stated that it was not prepared at that time to accept GE's generic proposed elimination of large transient tests for CPPU type uprates. The conclusions in the CPPU SE also stated that the Staff finds that information obtained from the MSIV closure and generator load rejection tests could be useful to confirm plant performance, adjust plant control systems, and enhance training material. Finally, the CPPU SE indicated that the Staff will continue to consider, on a plant-specific basis, the need to conduct these tests.

Q10. What impact do these NRC positions have on Entergy's EPU amendment request relative to the proposed elimination of large transient tests?

A10. (RBE, RLP, GT, SRJ) Entergy provided a plant-specific justification to not perform large transient testing in Attachment 7 of its Application, dated September 10, 2003 [Entergy Exhibit 5]; and it subsequently updated Attachment 7 in Supplement 3 to the EPU amendment request, dated October 28, 2003 [Entergy Exhibit 6]. Additional information was provided in Supplements 23, 28, and 30, dated February 24, April 22, and August 1, 2005, respectively [Staff Exhibits 9, 10, and 11].

Based on the Staff's CPPU SE, dated March 31, 2003 [Entergy Exhibit 25 (pages 3-87); Entergy Exhibit 30 (pages 3-87)], for BWRs utilizing the CPPU approach, licensees may provide plant-specific information to justify not performing the full load rejection and MSIV closure transient tests. The Vermont Yankee EPU is based on the CPPU approach, and, as part of its application, Entergy provided plant-specific information to justify not performing these tests for Vermont Yankee. Consistent with the guidance provided in SRP Section 14.2.1, the

[7] The generic guidance referred to herein was published in draft form in December 2002 [Entergy Exhibit 4]. The draft guidance was superseded upon issuance of the guidance in August 2006. *See* n.5, *supra.*

Staff found that the performance of those large transient tests was not necessary to demonstrate that SSCs important to safety would perform acceptably in service. This conclusion was based on the scope of the post-modification and power ascension test programs, the limited scope of physical modifications made to the plant, previous operating experience, the lack of significant new thermal-hydraulic phenomena associated with a constant-pressure power uprate, conformance with limitations associated with analytical analysis methods, and the absence of a significant change in the results of safety analyses.

Q11. Do you agree with NEC's and Mr. Gundersen's assertion that the Applicant's citation of operational experience elsewhere in the nuclear industry does not support an exception to performing large transient testing for Vermont Yankee at EPU conditions?

A11. (RLP, SRJ) No.

Q12. Please provide the basis for this conclusion.

A12. (RLP, SRJ) In accordance with Subsection III.C of SRP Section 14.2.1, industry operating experience is one consideration licensees may use to support an exception to certain EPU power ascension tests. The Applicant submitted information to the Staff citing both industry experience and Vermont Yankee plant-specific experience. The most relevant industry experience was that of Hatch Units 1 and 2 in 1998. In that case, the Staff granted an EPU without requiring the performance of large transient testing. Both Vermont Yankee and Hatch are BWR/4 designs with Mark I containments. Subsequent to its uprate, Hatch Unit 1 experienced a turbine trip in 2000 and a generator load reject event in 2001. Hatch Unit 2 experienced an unplanned event that resulted in a generator load reject from 98% of uprated power in 1999. These events produced no anomalies in the plant's response. This outcome supports the conclusion that extended power uprates at facilities of similar design are unlikely to produce new or unexpected phenomena in response to anticipated transients.

Q13. Do you agree with NEC's and Mr. Gundersen's assertion that Vermont Yankee's own experience with generator load rejections at 100% of the original licensed power level does not support the conclusion that there will be adequate plant performance during transients at EPU conditions?

A13. (RLP, SRJ, GT) No.

Q14. *Please provide the basis for this conclusion.*

A14. (RLP, SRJ, GT) In addition to the discussion of industry operating experience in A12 above, the licensee also cited plant-specific experience at Vermont Yankee, which included several generator load rejections from 100% of the original licensed thermal power. A generator load rejection in 2004 occurred after many physical modifications supporting the power uprate, including modifications to the main turbine and main feedwater system, had been implemented. No significant anomalies were seen in the plant's response to these events. In addition, the licensee stated that past transient and safety analyses correlate closely to results from actual transients. Thus, the Vermont Yankee operating experience supports the conclusion that the plant will respond as designed to transients at EPU conditions by demonstrating that many physical modifications supporting the uprate have not adversely affected the transient response and by validating analytical methods used to predict plant response with those modifications in place.

Q15. Do you agree with NEC's assertion that periodic testing of SSCs, during steady-state plant operation, does not confirm performance characteristics of SSCs required for appropriate transient response?

A15. (RBE, RLP, SRJ, GT) No. As described in the Staff's Final SE for the Vermont Yankee EPU, the purpose of the EPU test program is to demonstrate that SSCs will perform satisfactorily in service at the proposed EPU power level. The test program also provides additional assurance that the plant will continue to operate in accordance with design criteria at EPU conditions. Final SE at 260 [Staff Exhibits 1 and 2].

Technical Specification ("TS") surveillance testing of SSCs performed during steady-state conditions confirms performance of SSCs required for appropriate transient response. TS surveillance testing is conducted pursuant to 10 C.F.R. § 50.36 ("Technical Specifications"). Under that regulation, TSs are required to include items in the following five specific categories: (1) safety limits, limiting safety system settings, and limiting control settings; (2) limiting conditions for operation ("LCOs"); (3) surveillance requirements; (4) design features; and (5) administrative controls.

As discussed in 10 C.F.R. § 50.36(c)(2)(ii), a TS LCO must be established for each item meeting one or more of the following criteria:

Criterion 1: Installed instrumentation that is used to detect, and indicate in the control room, a significant abnormal degradation of the reactor coolant pressure boundary.

Criterion 2: A process variable, design feature, or operating restriction that is an initial condition of a design basis accident or transient analysis that either assumes the failure of or presents a challenge to the integrity of a fission product barrier.

Criterion 3: A structure, system, or component that is part of the primary success path and which functions or actuates to mitigate a design basis accident or transient that either assumes the failure of or presents a challenge to the integrity of a fission product barrier.

Criterion 4: A structure, system, or component which operating experience or probabilistic risk assessment has shown to be significant to public health and safety.

Criteria 2 and 3 relate, in part, to functional performance of SSCs necessary to demonstrate that the plant response to transients is as assumed in the associated safety analyses. Consistent with the requirements in 10 C.F.R. § 50.36(c)(3), TS surveillance testing (*e.g.*, component testing, trip logic system testing, and simulated actuation testing) assures that TS

LCOs are met. When an LCO is met, the associated SSC is considered to be operable. In this regard, the Vermont Yankee TSs define "operable" as follows:

> A system, subsystem, division, train, component or device shall be operable or have operability when it is capable of performing its specified safety function(s). Implicit in this definition shall be the assumption that all necessary attendant instrumentation, controls, normal or emergency electrical power sources, cooling or seal water, lubrication or other auxiliary equipment that are required for the system, subsystem, train, component or device to perform its function(s) are also capable of performing their related support function(s).

Vermont Yankee TSs at 2.

If a SSC is determined to be operable during TS surveillance testing, that determination provides assurance that the SSC is capable of performing its specified safety functions as assumed in the plant safety analysis. For example, the reactor protection system instrumentation that is relied on to mitigate large transients by providing a reactor scram (*i.e.*, MSIV closure, turbine control valve fast closure, and turbine stop valve closure) is tested quarterly, assuring it will carry out its safety function in the event of a large transient.

Based on the above, periodic testing of SSCs during steady-state plant operation can confirm performance characteristics of SSCs required for appropriate transient response. We therefore disagree with NEC's assertion concerning the periodic testing of SSCs during steady-state plant operation.

Q16. Administrative Judge Baratta has inquired as to how the calculations of mechanical stress on various components during a transient under EPU conditions were performed, and whether they account for stresses experienced during the transient. *See* Tr. 902, 903-04. Please address this question.

A16. (RBE) The Staff's SE for the CPPU topical report, dated March 31, 2003 [Entergy Exhibit 25 (pages 3-87); Entergy Exhibit 30 (pages 3-87)], discusses an acceptable methodology for evaluating the stresses on various components subject to increased loadings

ODYN has been approved by the NRC for application to transients such as feedwater controller failure - maximum demand; pressure regulator failure - closed; generator load reject; turbine trip; MSIV closure; loss of auxiliary power - all grid connections; and MSIV closure with position switch failure (MSIV flux scram).[8] ODYN is also approved for other anticipated operational occurrences ("AOO") events such loss of feedwater heating, pressure regulator failure - open, recirculation flow decrease events, recirculation flow increase events and increase in coolant inventory events.

Q19. Does Entergy's EPU application rely on analyses performed with ODYN as part of its justification for not performing large transient testing?

A19. (ZA, GT) Yes. As part of the NRC-approved standard reload process for BWRs, Vermont Yankee analyzed the limiting transients for each fuel cycle using ODYN. ODYN uses plant-specific core neutronic and thermal-hydraulic conditions as inputs. As part of its justification for not performing large transient testing, Entergy stated that the MSIV closure pressurization transient analysis (that bounds, from a pressurization standpoint, the load reject without bypass pressurization event) had been performed at Vermont Yankee for EPU conditions using the ODYN code. Entergy stated that the analyses assumed worse conditions than would be experienced during an actual transient. The results of the analyses showed that the response of the plant to this bounding transient to be acceptable.

Q20. How was the ODYN code qualified?

A20. (ZA, GT) The NRC Staff's approval of ODYN included evaluation of the performance of the code's analytical models by quantifying the accuracy of the code's

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[8] *See* Letter from Robert L. Tedesco (NRC) to Dr. G. G. Sherwood (General Electric Co.), dated February 4, 1981, and enclosed "Safety Evaluation for the General Electric Topical Report Qualification of the One-Dimensional Core Transient Model for Boiling Water Reactors, NEDO-24154 and NEDE-24154-P" (June, 1980) [Entergy Exhibit 26 (pages 4-109)], as supplemented by "Supplemental Safety Evaluation for the General Electric Topical Report Qualification of the One-Dimensional Core Transient Model for Boiling Water Reactors, NEDO-24154 and NEDE-24154-P" (January 1981) [Entergy Exhibit 26 (pages 110-125)].

predictions (*e.g.*, uncertainties) to be accounted for in the transient simulation. Some of the ODYN analytical models evaluated include: the recirculation loop model, the control systems model, the steam separator model, the upper plenum, vessel dome and bulkwater model, the steam line core thermal-hydraulic model (e.g., drift flux and mechanistic boiling), the core physics model, and the fuel heat transfer model.

The Staff compared specific models in ODYN against separate effects test data. The specific model assessment included code-to-code comparisons (e.g, ODYN thermal-hydraulic model against 3-D core simulator), ODYN comparisons to plant measurement data and separate effect test data. These assessments were used to establish the potential uncertainties and biases associated with the specific models in order to account for any potential under-predictions or conservatism in the code's simulation of plants' transient response. The Staff's assessment of ODYN also included comparisons of the code's predicted integral response against the integral test data (*e.g.*, three Peach Bottom Unit 2 ("PB-2") transient tests and one Muehleberg Nuclear Power Plant ("KKM") transient test), discussed below.

Finally, the Staff's assessment of ODYN included comparisons of its simulation of specific transients against the predictions of independent confirmatory analyses (BNL-TWGL and RELAP-3B). The confirmatory codes were benchmarked against the PB-2 transient test. The Staff evaluated differences between the PB-2 transient test results and the ODYN predictions. Based on the confirmatory analyses/ODYN code-to-code comparisons and the comparisons of ODYN predictions against the integral test data, the Staff quantified the uncertainties in ODYN's predictions that must be accounted for in the simulations of the plants' transients. The Staff found the use of ODYN acceptable for performing design bases transients, in a safety evaluation issued in 1981. *See* footnote 8 above. In November 1985, the Staff approved an updated version of ODYN that incorporated improvements in the specific models stemming from some of the differences observed in the PB-2 integral tests comparisons.[9]

Q21. Please describe the integral tests performed to validate ODYN.

A21. (ZA, GT): As stated above, integral tests were performed at Peach Bottom Unit 2 and at KKM, a Swiss BWR. The integral tests that were performed were as follows.

Peach Bottom 2 Integral Test: In April 1977, three integral tests were performed at PB-2. The PB-2 integral tests involved turbine trip transients with the turbine valve fast closure scram disabled. The tests were initiated from power levels of 47.4, 61.6 and 69.1 percent, and core flow rates of 100, 82.1 and 100 percent, respectively. Each transient test was initiated from a different control rod pattern and the results were compared against the axial power distribution shift in order to assess the one-dimensional nuclear model. One of the PB-2 tests included a control rod pattern selected to assess the ODYN model's capability to simulate the core wide radial power distribution effect. For each of the transient tests, the turbine stop valve scram was disabled and the reactor scrammed on high neutron flux. This is a conservative test because the delayed scram results in higher power response in comparison to the plant power response for direct stop valve closure scram. This was done to obtain transient results comparable in severity to licensing analyses.

KKM Integral Test: Integral tests were also performed at the Muehleberg Nuclear Power Plant (KKM), a BWR located in Switzerland. KKM is smaller than Peach Bottom Unit 2, and has a unique steamline/turbine configuration. The KKM plant has two turbines and two sets of steamlines with a reheater line in each steamline. These differences require spatial

[9] *See* Letter from Cecil O. Thomas (NRC) to J. S. Charnley (General Electric Co.), dated November 5, 1985 ("Acceptance for Referencing of Licensing Topical Report NEDE-24011-P-A, Rev. 6, Amendment 11, 'General Electric Standard Application for Reactor Fuel' (GESTARII))" [Staff Exhibit 17], as supplemented by Letter from Gus. C. Lainas (NRC) to J. S. Charnley (General Electric Co.), dated March 22, 1986 ("Acceptance for Referencing of Licensing Topical Report NEDE-24011-P-A, 'GE Generic Licensing Reload Report,' Supplement to Amendment 11" [Staff Exhibit 18].

modeling considerations for the ODYN simulations. Consequently, GE developed a special version of ODYN that models the KKM configuration. In addition, KKM differs from domestic BWRs in terms of measurement capability and actuation of the turbine stop valve and bypass. Again, the ODYN model and valve actuations were adjusted in order to simulate KKM valve actuations. The KKM turbine trip transient was initiated from 77% power at 86.5% core flow. The reactor was at end-of-cycle ("EOC"), all rods out, conditions. The KKM transient test resulted in milder pressurization response than the PB-2 tests; accordingly, most of the ODYN code validations that have been performed use the PB-2 tests.

Q22. Please describe the conclusions of the Staff's ODYN code assessment.

A22. (ZA, GT) The Staff compared the integral test results for key parameters against the ODYN predictions. In addition, the Staff evaluated the adequacy of the ODYN 1D Thermal-Hydraulic model against the integral tests by evaluating the Local Power Range Monitor (LPRM) flux reading and power distribution at a given axial location against the predictions. The change in critical power ratio ("ΔCPR") values predicted by ODYN for a given test were compared against the ΔCPR obtained in the integral tests by using the measured core parameters. The measured jet pump ΔP, measured pressure, and the measured power during the transient were used to predict the ΔCPR of the test.

The Staff found that the code demonstrates good prediction against existing test data obtained from separate effects and integral plant tests (*e.g.,* PB-2 and KKM). Comparisons of the PB-2 and KKM integral test data against the ODYN predictions indicate that the results are within the calculated uncertainties. The Staff found that the ΔCPR calculation from the ODYN code set is neither conservative nor non-conservative, but that it predicts the available data well and within the expected uncertainty range. Further, based on the Peach Bottom tests, the Staff determined that ODYN is a "best estimate" code for ΔCPR calculations.

Subsequent to the initial comprehensive assessment of the ODYN performance, GE incorporated improved analytical methods and revised specific models that provided input to ODYN. *See* footnote 9 above. The "improved" ODYN code set comparisons against the PB-2 tests yielded closer predictions to the test results than the original comparison. As specific input models are revised or improved, the fuel vendor has assessed the code against the original PB-2 test data in order to confirm that the code's performance is acceptable.

Q23. After its initial validation, was ODYN assessed against an EPU plant transient response?

A23. (ZA, GT) Yes. Several domestic BWRs that have implemented extended power uprates have experienced transient events; in addition, a foreign plant, Liebstat ("KKL") that had undergone an EPU performed large transient tests. In all transient events and tests at the EPU power levels, the plants responded as expected, without indicating any significant changes in the fidelity of the analytical models and codes at the EPU conditions. A review of these events was provided to the NRC by Exelon Generation Company, LLC ("Exelon"), in a letter supporting the EPU applications of the Dresden and Quad Cities plants, submitted in May 2001.[10] The following discussion summarizes the information provided by Exelon in its letter of May 18, 2001.

Exelon indicated that Hatch Units 1 and 2 implemented an EPU that was 13% above the original licensed thermal power ("OLTP").[11] The licensee (Southern Nuclear) did not perform

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[10] Letter from R. M. Krich, Exelon Generation Co., LLC, to NRC, "Additional Testing Information Supporting the License Amendment Request to Permit Uprated Power Operation at Dresden Nuclear Power Station and Quad Cities Nuclear Power Station," RS-01-104 (May 18, 2001) [Staff Exhibit 19]. This letter was cited in the Staff's approval of the Dresden power uprate applications. *See* "Safety Evaluation by the Office of [NRR] Related to Amendment No. 191 to Facility Operating License No. DPR-19, and Amendment No. 185 to Facility Operating License No. DPR-25, Exelon Generation Company, LLC, Dresden Nuclear Power Station Units 2 and 3, Dockets No. 50-237 and 50-249" (Dec. 21, 2001) [Staff Exhibit 20], at 90-98.

[11] Hatch Units 1 and 2 implemented a 5% stretch power uprate in 1995 and an 8% extended power uprate in 1998, therefore the total is approximately 13% above OLTP.

large transient testing. However, in 1999, while Hatch Unit 2 was operating at 98% of the uprated power level, it experienced a generator load reject transient event. The licensee compared the plant process and measurement data during the transient against ODYN predictions. The key parameters compared were reactor pressure, neutron flux, heat flux and changes in the reactor water level. Exelon concluded that for these key parameters that are important to the transient response, the recorded values were less than or equal to the values predicted by ODYN. *See* Staff Exhibit 19, at p. 2 of 11.

Exelon further indicated that Liebstat ("KKL"), a European BWR, also underwent transient testing as part of its uprate implementation plan. The plant was uprated in phases, with testing at the uprated conditions conducted: (1) in 1998, at 10.5% above OLTP, (2) in 1999, at 13% above OLTP, and in 2000 at 16.7% above OLTP. A turbine trip test was performed at 10.5% above OLTP. During the KKL testing, the following key parameters and system and actuation setpoint characteristics were monitored: reactor power, reactor vessel and turbine steam flow, reactor vessel and turbine pressure, effectiveness of the reactor recirculation runback, effectiveness of the selected rod patterns, and modified turbine control valve response characteristics. In its May 18, 2001 letter describing the results of these tests, Exelon reported a close match between the predicted ODYN calculations and the measured plant response. *Id.*, at pp. 2-3 of 11.

In addition to the Hatch and KKL experience cited above, on January 30, 2004, after implementation of its EPU, Dresden Unit 3 experienced an inadvertent turbine trip event, with the plant operating at a reactor power level of 97%.[12] Exelon's vendor (GE) performed a comparison of the actual Dresden plant response to the ODYN predicted response for a large

[12] *See* Dresden Nuclear Power Station Unit 3, Licensee Event Report 2004-002-00, dated March 30, 2004 [Entergy Exhibit 15].

transient with similar initial conditions and equipment availability. In a July 2005 document (GE-NE-0000-0041-1254-R0) [Entergy Exhibit 33], GE compared the ODYN predicted plant response against the actual plant response values. GE stated that the predicted trends and timing of the ODYN response were consistent with the actual trends and timing experienced in the plant response for key plant parameters such the neutron flux, reactor peak pressure and reactor vessel level. GE concluded that the Dresden 3 turbine trip comparisons demonstrate that ODYN as used for reload licensing analyses for plants that have undergone an EPU will conservatively predict the overpressure and minimum critical power ratio response.

Although the Staff has not reviewed the benchmarking performed for the transients at Hatch and Liebstat (KKL) discussed in Exelon's May 2001 report [Entergy Exhibit 19], a preliminary assessment of GE's July 2005 evaluation of the Dresden 3 turbine trip [Entergy Exhibit 33] indicates that, overall, the ODYN predictions appear to be generally consistent with the timing and trends of the plants' instrumentation readings. Specifically, for the key parameters important in pressurization response, the ODYN predictions are consistent with measured data. Further, other EPU plants which were analyzed with ODYN, that experienced transient events (*i.e.*, Brunswick, Dresden), have responded as analyzed, indicating no significant change in the overall accuracy of the ODYN code. Therefore, comparisons of ODYN against plant data at EPU conditions provide reasonable assurance that use of the ODYN code will acceptably simulate plant response to limiting pressurization response, in terms of peak pressure and change in the MCPR.

Q24. Having reviewed the assertions presented by Mr. Gundersen in support of NEC Contention 3, have you reached a conclusion as to the issue of whether the Applicant has adequately justified not performing large transient testing at EPU conditions?

A24. Yes. As discussed above in A8, 10 C.F.R. Part 50, Appendix B, Criterion XI, requires a licensee to establish a written test program to demonstrate that SSCs (defined in the

Introduction to Appendix B) will perform satisfactorily in service. In accordance with Criterion XI, the test program is required to include testing necessary to provide reasonable assurance that SSCs will perform satisfactorily in service following the EPU; an EPU test program, however, is not required to include the performance of any specific test. Entergy has provided acceptable information regarding its startup test program, and its relationship to the proposed EPU power ascension test program, which provides adequate justification for not performing the two large transient tests addressed in NEC Contention 3. Based upon our review of the contention and the bases offered in support thereof, and our review of the Vermont Yankee EPU application, and supplements thereof, we are satisfied that the Applicant has adequately justified not performing the MSIV closure test and generator load rejection test at Vermont Yankee under EPU conditions. Further, we have concluded that the Vermont Yankee EPU testing program satisfies the requirements of 10 C.F.R. Part 50, Appendix B, Criterion XI.

Q25. Does this conclude your testimony?

A25. Yes.

Ms. Zena Abdullahi
Senior Reactor Systems Engineer
Nuclear Regulatory Commission
Nuclear Reactor Regulation

EXPERIENCE

SENIOR REACTOR SYSTEMS ENGINEER — **May 1997 - Present**
BWR Systems Branch — *Rockville, Maryland*
Division of System Safety

- Responsible for evaluating technical merit of license applications requesting changes to operation of Boiling Water Reactors, including extended power uprate and operation at expanded operating domains. Review the impact of the proposed changes to the design bases safety analyses supporting the plants operation during steady state, transient and accident conditions. Principle topics of responsibilities include: core and fuel performance, ECCS-LOCA, instability, ATWS, safety system performance, neutron monitoring system actuation and trip setpoints.

- Responsible for evaluating topical reports submitted by fuel vendors. Topical reports present the analytical methods (core physics, fuel behavior, core thermal-hydraulic) used to perform the safety analyses, or describe the generic guidelines and the scope of analysis that would be provided in plant-specific applications that will implement proposed changes to nuclear plants licensed operation (e.g., power uprates, changes in operating power/flow operating domain, cycle length extensions, single recirculation loop operation).

- Responsible for leading and/or participating in technical audits of the analytical methods and calculations supporting generic topical report or plant-specific licensing applications.

- Responsible for communicating technical issues and staff positions with both internal and external stakeholders (NRC, fuel vendors, Owners Groups, ACRS).

GENERAL ENGINEER — **1995 - 97**
Nuclear Reactor Regulation — *Rockville, Maryland*

- Completed two years of development training program which includes rotational assignments and technical training. Rotational assignments included Project Licensing Directorate *(e.g., licensing project management)*, License Renewal and Standardization, Mechanical Engineering and Civil Engineering Branch *(e.g.,In-service inspection reviews)* and Office of Nuclear Material Safety and Safeguards-Office *(e.g.,Thermal analysis of Fuel transportation)*. Rotated to Pilgrim Nuclear Power Station Site.

STRESS ANALYST **1987 - 88**
Bechtel Eastern Power *Gaithersburg, Maryland*
Mechanical and Processing Division

- Performed stress analysis for TVA's Watts Bar Power Plant.
- Analysis of the effects of pressure, deadweight, thermal expansion, thermal transients loads, thermal anchor movement, design basis accident inertia and movement loads, seismic anchor movements, seismic and hydrodynamic loading.
- Proposed, initiated and completed a set of special calculations for the project procedure manual (Design Code: ASME, Section III; TPIPE)

EDUCATION

M.S. MECHANICAL ENGINEERING (Fluid and Energy Systems) *1995*
University of Maryland, College Park

- Graduate work included courses in computational fluid dynamics, compressible fluid flow, incompressible fluid flow, multi-phase flow and heat transfer, advanced topics of thermal science (computational two-phase flow), advanced convection heat transfer, advanced conduction and radiation heat transfer and combustion
- Independent research on "Comparisons of Predictions of Different Critical Power Correlations ." Conducted literature review on critical power flux phenomena. Modified CANAL, a program used in the analysis of fluid flow and heat transfer in the core of boiling water reactors; wrote subroutines that predict the occurrence dryout and locations using ten dryout correlations. Compared experimental data (e.g.,Oak Ridge National Laboratory) of dry out locations to the predicted values and locations for a given operating conditions.

B.S. Mechanical Engineering **1987**
University of California, Davis

NRC TRAINING

- Power Plant Engineering (E-100);
- GE Nuclear Technology (R-200B, R-304B, R-504B, and R-624B)
- Reactor Safety (R-800);
- GE Maintenance Overview (R-802),
- Containment Thermal-Hydraulic Review and Analytical Techniques,
- Probability and Statistics (P-102),
- PRA Basics for Regulatory Applications (P-105),
- Applied Statistics,
- RELAP-Novice User Workshop,
- Inspecting for Performance (G-303),
- Fundamentals of Inspection (G-101),
- OSHA Indoctrination (G-111),
- Site Access Training (H-100), M
- Motor Valve Actuators (E-112),
- NRC: What it is and What it Does,
- The Regulatory Process,
- Multi-phase Flow and Heat Transfer for Industrial Applications,
- Finite Element Analysis: Heat Transfer & Fluid Flow Applications:,
- Station Nuclear Engineer
- TRACE

RICHARD B. ENNIS
Statement of Professional Qualifications

CURRENT POSITION:

Senior Project Manager	Division of Operating Reactor Licensing, Office of Nuclear Reactor Regulation, U.S. Nuclear Regulatory Commission, Rockville, MD

EDUCATION:

B.S. in Electrical Engineering, Bucknell University, 1977

SUMMARY:

Over 28 years engineering experience in the commercial nuclear power industry. Significant experience in the following areas:

- Project Management
- Technical Writing
- Design & Licensing Basis Documentation
- License Renewal
- Nuclear Facilities Audits and Design Verifications
- Design Modifications
- Instrument Setpoint and Loop Uncertainty Calculations & Methodologies
- Software Development, Quality Assurance, and Verification & Validation

EXPERIENCE:

U.S. Nuclear Regulatory Commission, Project Manager, 1998 - Present

Project Manager in the Office of Nuclear Reactor Regulation. Serve as headquarters focal point for technical review coordination, information and communication on issues concerning assigned nuclear power plants. Responsibilities include coordination, review, and preparation of safety evaluations, environmental evaluations and other documentation to support the licensing activities for the plant. Also serve as lead project manager for special projects. Assignments have included the following:

- Lead Project Manager, Vermont Yankee Extended Power Uprate (10/05 - Present)
- Project Manager, Vermont Yankee Nuclear Power Station (12/03 - 10/05)
- Project Manager, Millstone Nuclear Power Station, Unit 2 (3/02 - 12/03)
- Project Manager, Hope Creek Generating Station (3/98 - 6/00, 11/00 - 3/02, 5/03 - 9/03)

- Lead Project Manager, Steam Generator Action Plan (11/00 - 6/01).

- Lead Project Manager, Indian Point Unit 2 Steam Generator Tube Failure Lessons-Learned Task Group (6/00 - 11/00).

<u>Scientech, Inc., Senior Engineer, 1997 - 1998</u>

Worked as a contractor for Baltimore Gas and Electric Company in the Calvert Cliffs Nuclear Power Plant (CCNPP) Life Cycle Management Group. Prepared technical reports for the CCNPP license renewal application to the NRC in accordance with 10 C.F.R. Part 54. Reports prepared for the Radiation Monitoring System, Chemical and Volume Control System, Saltwater System, Electrical Cables Commodity Evaluation, Instrument Lines Commodity Evaluation, Intake Structure, and Turbine Building.

<u>TENERA, Inc., Project Manager/Senior Engineer, 1988 - 1996</u>

Responsibilities included technical consulting, project management, budget and schedule control, marketing and business development, and preparation of proposals. Also served as corporate Configuration Control Manager (CCM) for development of computer software applications. CCM responsibilities included ensuring that software life cycle activities were implemented in accordance with quality assurance (QA) requirements. Managed and provided engineering support for numerous projects as described below.

- Commonwealth Edison Company - Managed and performed a license conformance review at the LaSalle plant that included developing plant licensing and design basis requirements from the UFSAR and reviewing these requirements against design documents and procedures (e.g., operations, maintenance, engineering) to ensure that the plant was operating within its design and licensing basis.

- Commonwealth Edison Company - Performed design basis verification for the Auxiliary Power System for Zion Station Units 1 and 2, and Standby Gas Treatment System for Dresden Station.

- Nebraska Public Power District - Authored the Reactor Protection System (RPS), Standby Liquid Control System, and Neutron Monitoring System design basis documents for Cooper Nuclear Station. Also performed design basis verification for the Reactor Protection, DC Electrical, Diesel Generator, Standby Liquid Control, Neutron Monitoring, and Control Rod Drive systems.

- Northern States Power Company - Performed reactor trip instrument setpoint calculations for Prairie Island Units 1 and 2.

- Northeast Utilities - Authored the RPS Equipment Coefficients Methodology for Millstone Unit 2. Also performed fuel reload analysis for fuel cycle 13.

- New York Power Authority, Consolidated Edison Company - Authored engineering evaluations and documents related to Electrical Separation for the FitzPatrick and Indian Point Unit 2 nuclear plants. Work included preparation of Electrical Separation Design Criteria documents, justifications for cable separation anomalies, review of cable and raceway installation standards, fault current analysis, and preparation of a training package.

- Philadelphia Electric Company - Authored the Regulatory Guide 1.97 Post-Accident Monitoring design basis documents for Limerick Generating Station and Peach Bottom Atomic Station.

- Florida Power and Light Company - Co-authored the RPS Equipment Coefficients Methodology for St. Lucie Unit 1. Also performed calculations to verify the methodology and performed fuel reload analysis for fuel cycles 12, 13, and 14.

- Portland General Electric Company - Performed audit of the setpoint control program for Trojan Nuclear Plant.

- Washington Public Power Supply System - Performed system review (mini-SSFI) of Process Radiation Monitoring System for WNP-2.

- Southern California Edison Company, Arizona Public Service Company, Baltimore Gas and Electric Company, Northern States Power Company, Wisconsin Public Service Corporation - Developed QA computer software applications for San Onofre Nuclear Generating Station, Palo Verde Nuclear Generating Station, Calvert Cliffs Nuclear Power Plant, Prairie Island Nuclear Generating Station, and Kewaunee Nuclear Power Plant. Software packages included instrument-related databases and reports, setpoint calculations, instrument calibration scaling, head correction calculations, and insulation resistance calculations. Work included full life cycle development of QA Verified and Validated (V&V) software applications in IBM PC DOS and Windows environments.

- Consolidated Edison Company - Prepared design modification package for Emergency Diesel Generator Building HVAC System for Indian Point Unit 2.

- System Energy Resources, Inc. - Performed FSAR review and updates for Grand Gulf Nuclear Power Station.

<u>Bechtel Power Corporation, 1977 - 1988</u>

Assignments were as follows:

- Instrument and Controls Group Leader and Electrical/Control Systems Deputy Supervisor, Davis-Besse Nuclear Power Station, Gaithersburg, MD (4/85 - 11/88). Supervised Electrical/Control Systems group (approximately 40 engineers). Coordinated and reviewed design work including revision and issue of the following types of documents:

specifications, control board layouts, loop diagrams, instrument installation details, tubing isometrics, instrument index, setpoint index, P&ID's, electrical schematics, connection diagrams, safety evaluations and conceptual designs. Responsible for design and specification of instrumentation and controls equipment. Responsible for preparing schedules, man-hour estimates, and staffing requirements.

- Results Engineering Group Leader, Wolf Creek Generating Station, New Strawn, KS (1/83 - 4/85). Supervised instrument and controls engineers in Results Engineering group (approximately 10 engineers). Coordinated all work related to generation of Wolf Creek instrument calibration documents. Reviewed instrument calibration data and prepared setpoint calculations. Generated startup field reports and processed instrument change requests. Reviewed startup test procedures and test results and wrote engineering procedures. Coordinated with instrument and controls maintenance group and startup group to support component and system tests.

- Instrument and Controls Group Leader, Grand Gulf Nuclear Power Station, Gaithersburg, MD (1/81 - 1/83). Supervised instrument and controls engineers in systems group (approximately 6 engineers). Coordinated and reviewed design work including logic diagram, loop diagram, and P&ID revisions; instrument calibration data; and design changes to comply with new licensing requirements.

- Instrument and Controls Engineer, Grand Gulf Nuclear Power Station, Gaithersburg, MD (7/79 - 1/81). Designed logic, loop and level settings diagrams. Prepared instrument calibration data and wrote instrument purchase specifications and evaluated bids. Prepared stress and seismic calculations and resolved startup field reports and field change requests.

- Instrument and Controls Engineer, Davis-Besse Nuclear Power Station, Gaithersburg, MD (7/77 - 7/79). Designed logic diagrams and prepared control valve specifications. Completed valve data sheets and ran computer program for instrument index updating.

Steven R. Jones
Statement of Professional Qualifications

EXPERIENCE:

Office of Nuclear Reactor Regulation, U.S. Nuclear Regulatory Commission

Acting Chief, Balance of Plant Branch: November 2004 - Present

Supervised the safety review of mechanical systems other than those directly associated with the nuclear steam supply system, which are referred to as "Balance-of-Plant" systems. In this capacity, I have supervised the NRC Staff's technical review of Balance-of-Plant systems review activities related to operating reactor license amendment requests (e.g., power uprate license amendment requests), aging management program scope for license renewal, design certification of new reactor designs, and operating experience analysis and resolution of associated generic safety issues.

Senior Reactor Systems Engineer: August 2001 - Present
Reactor Systems Engineer: October 1990 - June 1997

Performed evaluations of significant changes in design or operational limits and other technical issues related to secondary safety systems at commercial nuclear power plants, with a focus on service water cooling systems, power conversion systems, compartment transient analysis, spent fuel storage, and control room habitability. Assessed system capability and potential system failure modes. Reviewed system design to verify compliance with NRC regulations, applicable regulatory guidance, and industry standards. Evaluated technical safety issues involving spent fuel cooling and other secondary safety systems, and presented briefs regarding resolution of these issues to NRC senior management, the NRC Chairman, and advisory committees. Evaluated research reports related to secondary safety systems and recommended direction for future research activities.

NRC Region I, U.S. Nuclear Regulatory Commission

Senior Resident Inspector / Resident Inspector: June 1997 - July 2001

Planned and led implementation of the resident inspection program at Millstone Unit 2 under the revised Reactor Oversight Program. Monitored plant management performance and the conduct of operational, maintenance, and engineering activities at the unit with respect to the maintenance of reactor safety and compliance with NRC regulations. Evaluated the capability of important structures, systems, and components to perform their functions under limiting design conditions, based on mechanical design, fluid dynamics, heat transfer, electrical circuit analysis, control systems, and other technical considerations. Verified that the physical condition, maintenance practices, and operating procedures were consistent with maintaining the reliability of associated structures, systems, and components in performing their design functions. Used knowledge of risk analysis and the NRC's Significance Determination Process to evaluate several inspection findings involving degraded performance of essential mitigating systems. Analyzed the causes of degraded conditions to develop meaningful assessments of plant management performance and corrective action program effectiveness. Developed written reports to document technical issues and NRC performance assessments.

United States Navy

Nuclear Power Trained Submarine Officer: 1984 - 1989

Responsible for nuclear propulsion plant operations on board nuclear-powered submarine USS Simon Bolivar (SSBN-641). Developed an excellent understanding of design principles and operational characteristics of systems supporting submarine operations and systems associated with naval pressurized water reactors. Utilized principles of system design and operating characteristics to effectively execute the ship's operational mission and ensure safety during maintenance and testing activities. Enforced high standards of safety and workmanship during maintenance and repair periods through frequent inspection.

EDUCATION:

B.S., Marine Engineering, 1984
U. S. Naval Academy, Annapolis, MD

Graduate Studies in Mechanical Engineering, 1992 – '93
University of Maryland, College Park, MD

QUALIFICATIONS AND TRAINING:

Qualified NRC Operations Inspector (PWR), 1998
Qualified Submarine Officer, U. S. Navy, 1989
Qualified Engineering Officer of the Watch/Engineering Duty Officer, U. S. Navy, 1987

Training Courses:

- Westinghouse Technology (full series)
- Combustion Engineering Technology (cross-training series)
- General Electric Technology (short course)
- PRA Technology and Regulatory Perspectives (P-111)
- Perspectives on Reactor Safety (R-800)
- Root Cause/Incident Investigation Workshop (G-205)

Reactor Inspection and Oversight Program (G-200)
PRA Basics for Regulatory Applications (P-105)
Inspecting for Performance (G-303)
Fundamentals of Inspection (G-101)

CERTIFICATES AND LICENSES:

Licensed Professional Engineer (Mechanical): Maryland, 1996

ROBERT L. PETTIS, JR., P.E.
Statement of Professional Qualifications

CURRENT POSITION:

Senior Reactor Engineer
Division of Engineering
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Rockville, MD

EDUCATION:

B.S. in Civil Engineering, Northeastern University, 1975
M.S. in Civil Engineering (Structural Major), Northeastern University, 1977

PROFESSIONAL:

- Registered Professional Engineer (Maryland, California, and Massachusetts).
- Former Part-time Faculty Member, California State University (teaching undergraduate civil and structural engineering courses).

SUMMARY:

Over 30 years engineering experience in the commercial nuclear power industry. Significant experience in the following areas:

- Engineering management
- Technical writing
- License renewal reviews and audits
- Nuclear facilities audits, inspections, and design verifications
- Structural engineering and design
- Software quality assurance, verification and validation
- Extended power uprate reviews
- Professional engineer review of ASME Class I component supports

EXPERIENCE:

U.S. Nuclear Regulatory Commission, Staff Engineer, 1984 - Present

Reactor Engineer/Senior Reactor Engineer in the Office of Nuclear Reactor Regulation (NRR). Initially assigned to the Vendor Inspection Branch of NRR, where I was responsible for leading multi-discipline engineering team inspections at nuclear vendor, NSSS, and licensee facilities. Inspection areas included quality assurance compliance to 10 C.F.R. Part 50, Appendix B, and

10 C.F.R. Part 21; licensee procurement and dedication; inspections in support of allegations; and regional initiated inspection requests. For the past several years, my responsibilities primarily included leading on-site audits of licensee scoping and screening programs in support of license renewal activities; extended power uprate reviews of licensee power ascension and testing programs; and required presentations before ACRS.

As part of my responsibilities, I was also involved with the large transient testing issue in the NRC staff's review of the General Electric (GE) Licensing Topical Reports (LTRs), including review of the Constant Pressure Power Uprate (CPPU) LTR report, and I prepared a section of the staff's SE for these submittals. Additional EPU experience was also gained from previous reviews of EPU applications performed prior to the staff's development of a new Standard Review Plan (SRP). I co-authored SRP Section 14.2.1,"Generic Guidelines For Extended Power Uprate Testing Programs," which provides staff guidance on evaluating a licensee's EPU application in relation to the original startup testing performed at the plant under review.

These reviews were performed in accordance with the staff-approved GE LTR NEDC-32424P-A, "General Guidelines for General Electric (GE) Boiling Water Reactor (BWR) Extended Power Uprate," (known as "ELTR-1"). Section 5.11.9 of ELTR-1, "Power Uprate Testing," was the first document to establish the guidelines for large transient testing for GE BWRs. I was also the primary staff presenter to the ACRS for the large transient testing issue associated with the Clinton nuclear power plant's EPU, which utilized the GE CPPU approach, and I presented the staff's draft SE results for the large transient testing issue to the ACRS, at the VYNPS EPU public meeting held in Vermont in November 2005.

ITT Grinnell Corporation, Regional Engineering Manager, 1979 - 1984

Regional Engineering Manager for the Engineered Piping Products Group of ITT Grinnell, located in Huntington Beach, California. Responsible for initial establishment and location of the office, budget, lease negotiating, staffing, and training of over 20 engineers engaged in the preparation of structural pipe support designs for nuclear facilities. Reported to the Vice President of Operations located in headquarters in Providence, RI.

Stone & Webster Engineering Corporation, 1972 - 1977

Performed various assignments within the civil and structural engineering departments of the Boston Design Division while on co-op from Northeastern University and later full-time. Responsibilities included technical drafting, project management, and preparation of engineering calculations for numerous nuclear power plants designed by Stone & Webster.

GEORGE THOMAS
REACTOR ENGINEER (NUCLEAR)
BWR SYSTEMS BRANCH
DIVISION OF SAFETY SYSTEMS
OFFICE OF NUCLEAR REACTOR REGULATION

GENERAL BACKGROUND

I have a total of 37 years of nuclear power plant experience related to boiling water reactors (BWRs), of which five years are in reactor operations. My experience has included a broad range of functions related to the design, engineering, testing, operations, and evaluation of nuclear plant systems. I performed construction tests, pre-operational tests and normal operations of the plant while working as an operator at Tarapur, a BWR built by General Electric (GE) and Bechtel in India (1967-1972). I was engaged in the design and engineering of reactor and component systems for a BWR while working with Stone & Webster Engineering Corp (1975-1980). While employed at United Engineers & Constructors (1973-1975), I wrote test procedures and system descriptions for a BWR.

NRC EXPERIENCE

Since 1980, I have served as a senior reviewer in the area of reactor systems for Boiling Water Reactors, in the BWR Systems Branch of the Division of Safety Systems, Office of Nuclear Reactor Regulation (NRR), U.S. Nuclear Regulatory Commission (NRC), in Rockville, MD. This involves reviews and evaluations of operating reactor licensing actions including power uprates, license renewals, and the Advanced Boiling Water Reactor (ABWR) and Economical Simplified Boiling Water Reactor (ESBWR) reviews for design certification. I also perform evaluations of multi-plant licensing actions and generic issues in the BWR Systems Branch's area of responsibility. As part of my duties, I provide expert technical advice, consultation, and recommendations within the BWR Systems Branch's area of review responsibility to other NRR branches, NRC offices, and NRC regional offices.

Among my responsibilities at the NRC, I was the lead reviewer for the extended power uprate review of the Clinton nuclear power plant, which the NRC approved in 2002. I also participated in the NRC Staff's power uprate review of the Brunswick nuclear power plant. The scope of my review of the Vermont Yankee power uprate included the functional design of the Control Rod Drive System, the Standby Liquid Control System, and transient and accident analyses.

PREVIOUS EMPLOYMENT

From 1975 to 1980, I was a Systems Engineer in the power division of Stone & Webster Engineering Corp. In that capacity, I performed detailed engineering and design of reactor systems of a BWR. My duties included project interface and coordinating work with the nuclear steam system supplier (NSSS) (GE) and the electric utility company.

From 1973 to 1975, I was employed by United Engineers & Constructors (UE&C), in Philadelphia, PA. Initially, I was a Test & Start-Up Engineer in the UE&C Construction Division. In this capacity, I wrote various procedures and systems descriptions for a BWR.

Subsequently, I worked as a staff Engineer on the UE&C Nuclear Technical staff. In that capacity, I was engaged in providing technical expertise and consultation services to all nuclear projects of UE&C.

From 1967 to 1972 I served as a Reactor Operator at the Indian Atomic Energy Commission's first commercial nuclear power station, Tarapur 1 & 2 (a BWR built by Bechtel and GE). There, I participated in construction tests, pre-operational tests and normal operations of the station.

EDUCATION

I received a Bachelor of Science degree in Physics from Kerala (India) University in 1963. I also took graduate and professional courses in Nuclear Engineering at the University of Pennsylvania and the Engineers Club, in Philadelphia, PA, in 1975.

Other educational background and training included the following courses:

Perspectives on Reactor Safety - 2000
GE Nuclear Engineering Course - 1999
PRA Basics for Regulatory Applications - 1998
GE BWR/4 Technology Review - 1997
Power Plant Engineering - 1976
PWR technology course - 1980 (NRC sponsored)
BWR/6 simulator course - 1981(NRC sponsored)
Reactor operators training program (Tarapur Atomic Power Station, India) - 1969

MR. HAMRICK: Thank you, Your Honor.

MR. TURK: And, Your Honor, with that, I'll hand three copies of the testimony in its complete form with the professional qualification statements attached to the Court Reporter?

CHAIR KARLIN: Yes, please. And have you given it to other counsel for other parties?

MR. TURK: All parties have it.

CHAIR KARLIN: Okay. With that, I think we're ready to try to begin asking questions of the witnesses for the Staff. Again, same thing. If we ask a question you don't understand, if by some wild flight of imagination we ask a compound question, or a long question, you can ask us to break it down into pieces.

And, if you don't understand the question, or if you need a break, let us know. We're planning to go until about six o'clock or as long as we can go reasonably here.

If there's an exhibit that you want to refer to in answering the question or that would help, that would be very great, just pull it out and we'd like to have you refer to it.

And generally, you know, you're witnesses. You're testifying to facts and information that you have personal knowledge of. And please focus on that, except where we ask for your opinion on some matter. With that I'll turn it over to my colleagues for questions.

ADMINISTRATIVE JUDGE RUBENSTEIN: Okay, let's start back with what Entergy defines as transients. Do you have any differences of opinion on how Entergy defines transients? I would like just one person to answer.

WITNESS JONES: This is Steve Jones. We saw no difference in how Entergy defines transients.

ADMINISTRATIVE JUDGE RUBENSTEIN: Do you agree with the time period of the transient that is for each of the two transients that we talked about at some length.

WITNESS PETTIS: Could you repeat that, please? Could you repeat the question?

ADMINISTRATIVE JUDGE RUBENSTEIN: We went into a fair amount of detail on the time period, and the phasing, and the different events in the transients.

Rather than have me ask you item by item, by item, do you agree with the Entergy presentation of how long it takes for the main steam isolation valves, for example, to close, for the scram to occur, for when the initial onset of the pressure peak occurs, and as it decays?

Is there any difference of opinion between what Entergy proposed?

WITNESS THOMAS: Exhibit 28 is the supplemental licensing report for the current EPU cycle. And in that exhibit there is a fig, actually. They talk about event and the generator trip.

And all the time seconds show it's in -- they are in agreement with what they gave us totally.

ADMINISTRATIVE JUDGE RUBENSTEIN: Okay, thank you.

CHAIR KARLIN: So, you are saying you are in general agreement with the time periods that they describe.

WITNESS THOMAS: Right.

CHAIR KARLIN: That Entergy witnesses --

WITNESS THOMAS: It can vary a little bit, you know, maybe a few seconds. But, in general, it may be happening slightly, you know, little bit early, you know, all that.

But, in general, we agree that it will happen in four to eight seconds.

ADMINISTRATIVE JUDGE RUBENSTEIN: In the MSIV sequence, assuming fast closure of the MSIV, scram by backup flux, what is your opinion of the pressure increase in the reactor and the increase of core reactivity and their compensating values?

(No verbal response.)

ADMINISTRATIVE JUDGE RUBENSTEIN: Entergy testified basically that one mitigates the other.

WITNESS ABDULLAHI: Okay. This is Zena Abdullahi. I do agree with what basically they said. But, if you want us to restate our position or our understanding of event, basically the MSIV do close.

That's a mitigating initiating event, single failure. And, when the MSIV close they will close within three to five seconds is the understanding or the requirements, expectations.

And, when the MSIV close you're going to end up with no more steam flow out of the FSO, and then you're going to have, you know, pressure go up, voids collapse, power go out.

It's a feedback, reactivity feedback issue. So now what you have to deal with is at what point do you in pact have the SRVs open. Oh, the scram would be initiated by the fact that you're going to have the MSIVs closed.

And, when the MSIV close, you're going to have a scram initiated. It's finite time in which that scram will -- meanwhile you will have peak pressure go up and power go up.

Then SRVs will open or the operators will actually initiate that. And from there you would start reducing the pressure and then the scram will. The rest you would just have to continue with an isolating in trying to cool down the reactor using the high pressure system and the SRVs.

Now, the events are very known event systems. And the sequence are well defined. And they analyze ever reload with that particular plant. And what's analyzed is both the flux scram case, which is the ASME over pressure requirement, as well as the, you know, the non-limiting cases which you would expect the plant to experience.

ADMINISTRATIVE JUDGE RUBENSTEIN: The analysis is provided by Vermont Yankee or is --

WITNESS ABDULLAHI: The analysis --

ADMINISTRATIVE JUDGE RUBENSTEIN: -- there any staff independent analysis?

WITNESS ABDULLAHI: No, these analysis are -- they are two different things. One is that every reload you're going to have core design changes. And, when you have those core design changes, the plant responds and reactivity will change.

And, as a result of it, one of the requirement in the licensing processes where the field vendor has submitted a licensing methodology which basically says I'm going to do these analyses at this time, I'm going to use this code, and this is the code that you have approved.

Through that process NRC had approved that the licensee will perform transient analysis every reload. And those transient analysis are the limiting transient analysis.

And it also includes the MSIV closure with the conservative assumption of flux scram.

ADMINISTRATIVE JUDGE RUBENSTEIN: And this is based on the fact that the licensee says I'm going to use the previously approved methodology.

WITNESS ABDULLAHI: Exactly.

ADMINISTRATIVE JUDGE RUBENSTEIN: And they do not submit the details for analysis?

WITNESS ABDULLAHI: It is available in servers, which is what we have here. And, on top of it, we also do audits. And, for EPU in particular, we will audit and look at some of the analyses, sometimes to decide whether the information is conservative or not.

ADMINISTRATIVE JUDGE RUBENSTEIN: So

that's more of a quality audit?

WITNESS ABDULLAHI: Exactly.

ADMINISTRATIVE JUDGE RUBENSTEIN: They also made a point that the pressure pulse doesn't necessarily affect the RPS logic or the scram reactivity decrease, which is offset by the moderator reactivity increase, which we addressed a moment ago.

And I want to make sure that there's agreement with us. We don't have to do the magnitudes and the comparison. But, you're aware of what they said and you agree with that?

WITNESS ABDULLAHI: In terms of?

ADMINISTRATIVE JUDGE RUBENSTEIN: In terms of the pressure and heat flux.

WITNESS ABDULLAHI: Power, right. The CRD system, if you didn't increase the dome pressure, then the scramming all through CRD system would not change significantly.

Therefore, the scram will occur at 125 percent flux. Okay? And it's going to occur at that time. And it's quite reliable in terms of RPS system. Now, I'm not the instrumentation type.

So, any details on reliability of instrumentation or RPS, somebody else would have to answer. But, in terms of your specific question of do we expect that with no dome pressure increase would the scram capability or scram timing be minimally affected?

The answer to that is yes, we expect that. And the other issue you brought up was? Please jog my memory? The other point was the --

ADMINISTRATIVE JUDGE RUBENSTEIN: Well, they spoke about the fact that the scram decreased the void faction, decreased the moderator. And this is offset -- this would cause a pressure increase and is offset by the heat power increase. I think you addressed that.

WITNESS ABDULLAHI: Right. I mean, I agree with that. If the scram occurs at certain time with a certain speed, and I suppose they were assuming 3.5 seconds, I would have to look at the details.

But, what you have is the isolation, the pressure increasing, the void collapsing and the scram initiate at the same time. So, by the time you achieve the scram and you also then would have that peak pressure, it will occurs.

And the whole goal of analysis is to ensure that that peak pressure does not reach the ASME design requirement. And the difference is though is that the analysis will assume a more limiting condition of flux scram, which would delay the scramming, which would mean the peak pressure will be higher by the time you scram.

So, the results that you will gain in terms of peak pressure for the flux would be more limiting than what will happen at the plant. Because at the plant you would automatically, as soon as the valve MSIV closed by ten percent, then you would end up having the scram initiated earlier.

So the analysis is more conservative than what we'll expect to happen at the plant and what have actually happened in EPU plants.

ADMINISTRATIVE JUDGE RUBENSTEIN: I think we'll get into that a little more in terms of the calculation. But, I don't want to recover the ground that we did to set the stage for understanding what the transients were.

So I want to move on to picking up on some of the phenomena that we discussed before. I was going to move on to the thermal hydraulic phenomena.

CHAIR KARLIN: Are you done talking about transients?

ADMINISTRATIVE JUDGE RUBENSTEIN: No.

CHAIR KARLIN: Okay.

ADMINISTRATIVE JUDGE RUBENSTEIN: Is there any evidence that either steady state or during the transient that the operation at 120 percent will introduce any new thermal hydraulic phenomena as far as any other you know?

Are you all -- who is most knowledgeable to discuss that? You can take the lead and consult your other people.

WITNESS THOMAS: The EPU conditions, the operating parameters, they may be increasing. Like steam flow and also the water flow and other parameters.

But the phenomena has not changed. And there is no new phenomena at all for the EPU conditions.

ADMINISTRATIVE JUDGE RUBENSTEIN: So, you know of no calculations which have new phenomena?

WITNESS THOMAS: Now, we've been through about maybe five or six EPU applications. We have reviewed Dresden, Quad Cities, maybe five or six. So, basically all that experience, you know, you could not see any new phenomena because of the EPU operation.

ADMINISTRATIVE JUDGE RUBENSTEIN: Have any of you examined plant data to affirm that? Has any submittal ever included any information which spoke about new thermal hydraulic phenomena?

Or during the course of your review or during the course of your request for additional information, have you ever run across any responses which affirm that there might be or conjectured about new thermal hydraulic phenomena?

WITNESS JONES: We have looked at licensee event reports related to other units that have gone through extended power uprates and experienced transients from those conditions, looking for examples of new phenomena, or for different responses in the systems that were modified, or just as a result of the increased steam flow or feed flow, and we have not observed any.

And we didn't see any modifications to Vermont Yankee that were inconsistent with the modifications that were implemented at other facilities.

CHAIR KARLIN: Were they all consistent?

WITNESS JONES: In general, yes.

CHAIR KARLIN: Not inconsistent doesn't mean consistent. Were the modifications all quite identical?

WITNESS JONES: By and large all the plants implement modifications to their turbines, the high pressure turbines usually go to a more efficient model, more efficient low pressure turbines, various modifications to the feedwater and condensate systems.

But they have not involved new pumps --

CHAIR KARLIN: Well, they have 20 or so listed in their exhibit number 39. Are those all the same ones that are done at all the other EPUs you have approved?

WITNESS JONES: Not identical, but they fall under similar categories. Just enhancing the capability of providing feedwater flow without substantially reconfiguring piping, or adding additional pumps. They are operating an additional pump but they are not adding new pumps, or new valves, things of that nature that might cause new hydraulic phenomena.

CHAIR KARLIN: May I ask, have any of you done a large transient test at a nuclear reactor?

WITNESS ABDULLAHI: Have any of us done --

CHAIR KARLIN: Have you ever, I mean, there is such a thing as a large transient test, and MSIV closure test at a nuclear reactor. They have been performed in the past.

Have any of you been at a reactor, working at a reactor, consulting at a reactor, where one was done?

WITNESS THOMAS: Long time ago --

CHAIR KARLIN: No?

WITNESS THOMAS: I was in a reactor one day --

CHAIR KARLIN: Well, let me get -- Ms. --

WITNESS ABDULLAHI: I have not.

CHAIR KARLIN: Mr. Thomas?

WITNESS THOMAS: No, I have not.

CHAIR KARLIN: Okay, but Mr. Thomas, you were?

WITNESS THOMAS: Yes.

CHAIR KARLIN: Okay.

WITNESS THOMAS: I used to be an operator 40 years ago and I participated in the startup and the pre-operational stuff at BWR, but that was a long time ago, and I don't remember all the details. But I was part of the team.

CHAIR KARLIN: So this was 40 years ago, and what facility was that?

WITNESS THOMAS: It was in 1969.

CHAIR KARLIN: In '69, okay.

WITNESS THOMAS: In India.

CHAIR KARLIN: Okay. All right, let's see, I had another question.

WITNESS ABDULLAHI: I just want to make a correction to the statement you made, for clarity. I think Dr. Rubenstein asked a question about any new thermohydraulic phenomena, if we knew, or if we thought about it.

CHAIR KARLIN: Right.

WITNESS ABDULLAHI: I just want to make the clarity that there are changes in the core due to the EPU, on the core thermohydraulic condition.

We review and evaluate those conditions, and we address accordingly. I just wanted to make sure the difference between a new phenomena versus a change.

ADMINISTRATIVE JUDGE RUBENSTEIN: The operative word is unexpected or new phenomena.

WITNESS ABDULLAHI: That I do not have. Sorry to have interrupted you, but I just wanted to make sure.

CHAIR KARLIN: Maybe if I could, I'm not sure. We asked this question of the Entergy witnesses, so I would like to pursue a similar line.

There is this event called a main steam isolation valve closure event, I guess, and that is a transient. And you can do a test of that, you can do a transient test.

Does the Staff, does the NRC Staff have a specific MSIV test in mind when you say, when SRP says, such a test needs to be done, unless an exclusion can be justified? Mr. Ennis?

WITNESS ENNIS: If you look at Entergy exhibit --

CHAIR KARLIN: I'm sorry, there was a noise. That is exhibit 4?

WITNESS ENNIS: Attachment 2 in there lists transient tests that are addressed for EPU, and then within those, in that table, they've got the load rejection test that is shown on page 14.2.1-17, and the MSIV closure is on page 14.2.1-18.

And it specifies, in the fourth column over, typical acceptance criteria that you would expect for those kinds of tests. So earlier, in the SIP it discusses, you know, it references these tables.

CHAIR KARLIN: Right.

WITNESS ENNIS: These are the kinds of things that they did a test, the test procedure should have these types of responses, system responses, in the test procedure such as, you know, automatic transfer of loads, as designed, and load sequencing, safety systems such as RCIC and HPCI respond as expected.

One important thing on the load rejection is that --

CHAIR KARLIN: Well, let me just focus, that is great, because this is a question I had about that. So on the SRP there is an attachment 2 that, on page 14.2.1-18, at the bottom, if I've got this right, that is the MSIV test.

It says dynamic response of plant to automatic closure of all main steam isolation valves. That is the test. Column 4, that you are referring to, and my question is, when you say that, when this SRP says that, is there some, you know, instruction book, or a given test, what we mean is this test?

And I'm not sure whether this answers it. On column 4 it says, the title of that is typical transient test acceptance criteria and associated functions important to safety.

And it says, performance in accordance with design, acceptance criteria include MSIV closure. Does that say something to you that says there is an objectively verifiable test that must be run, and this is what it is?

WITNESS ENNIS: In that particular one you have your tech spec surveillances where they look at MSIV closure, 3 to 5 seconds, so that is the kind of response you would be looking for.

If you look at page 11 of the SRP, the second bullet from the top, it gives you a little direction there on what you would expect.

It says: Licensees should propose appropriate testing and acceptance criteria that ensure that the plant responds within design predictions. Predicted responses should be developed using real or expected values of items, such as beginning of life core reactivity coefficients, flow rates, pressures, temperatures, and response time to equipment and actual status of the plant, and not the values of plant conditions used for evaluations of postulated accidents.

CHAIR KARLIN: Okay.

WITNESS ENNIS: So, in other words, for MSIV closure large transient test, you wouldn't want to bypass the position scram to go to the flux scram. Even though that the accident analysis may assume the flux scram, plants design scram when the valve goes about ten percent closed. That is the way you have to run the test.

CHAIR KARLIN: So this says, the licensees should propose appropriate testing and acceptance criteria, predicted responses should be developed using real or expected.

So the answer is Entergy comes up with a proposal to customize type of MSIV test, there is no off-the-shelf MSIV test that has to be imposed by this SRP, is that right?

WITNESS ENNIS: That is correct.

WITNESS ABDULLAHI: Let me make a little explanation, if possible. There is a, in every FSAR, which is the final safety analysis report, of every plant, it specifies every design basis analysis. And in each design basis analysis it also specifies a sequence of events that is expected.

And so, in a way, while it doesn't tell you where the test is, and whether this is this or that, but the analysis expected, or the type of MSIV flux scenario is in the FSAR. So it is not that they have to grab it from a tree, or something.

So sequence of events is defined.

CHAIR KARLIN: But is there an off-the-shelf MSIV closure test, which is imposed, unless someone justifies an exemption?

WITNESS ABDULLAHI: No.

WITNESS JONES: No. So by regulation we cited it in our response to question 8 in our testimony, 10CFR50(34)B6-3, requires each licensee to identify a pre-operaTional test plan.

And that would usually incorporate acceptance criteria for each individual test. And then we would review that in accordance with REG Guide 1.68, which was exhibit 6, I think. I'm sorry, Staff exhibit 4.

And also, I'm sorry, that is the --

CHAIR KARLIN: Okay, I take your point that the licensee proposes a test and you all decide whether that is the appropriate test, and there is no objectively determinable test that I could refer to and say, yes, this test has been done, or hasn't been done.

You come up with it in any given case. Let me ask, then, what is involved in an MSIV transient test in the sense of level of -- what would you require if you, the Staff, were imposing as SRP14.2.1 generally imposes, what level of effort?

Is there additional data obtained in conducting such a test? Or is it just like an unplanned transient? Ms. Abdullahi, are you the person who would answer this?

WITNESS ABDULLAHI: I think we need to have a process of somebody designated you should ask.

CHAIR KARLIN: I will designate it. Let's start with you.

WITNESS ABDULLAHI: Okay. Is there a specific way to -- what would we be looking for?

CHAIR KARLIN: What is entailed in doing such a test that is different from an unplanned transient? Let me posit the analogy we've discussed earlier this morning.

Which is a volvo car crashes, when such a car crash occurs at 40 miles an hour, into an object, there are scientists standing there with their clipboards, and their white lab coats.

And there are TV cameras going, and there are monitors, and there is dummies in there, and there is lots of data being collected.

And, boy, they get some data out of that because they don't want to ruin a car for nothing. But likewise every day of the week volvos ram into something at 40 miles per hour, and data is collected from that event as well.

My question then is, is additional -- what additional data, if any, is gathered in doing a large transient test in an MSIV closure?

WITNESS ABDULLAHI: Can I reverse your question a little bit? Maybe I can explain it better. If I say, first of all, what data is available in a plant, whenever a transient offers?

CHAIR KARLIN: No, I don't want that, I want that as a baseline.

WITNESS ABDULLAHI: Okay.

CHAIR KARLIN: Let's leave it as a baseline, there is data available from an unplanned transient.

WITNESS ABDULLAHI: What additional --

CHAIR KARLIN: -- additional data gathered when you have a planned transient test?

WITNESS JONES: If I may?

CHAIR KARLIN: Go ahead.

WITNESS JONES: This goes back to, I guess, the initial test plan, what test plan the Staff has approved for the plant, in performing the main steam isolation valve test.

CHAIR KARLIN: You mean the original one, way back at the beginning? Okay.

WITNESS JONES: And there will be some acceptance criteria defined for that. I would expect that the --

CHAIR KARLIN: Are you familiar with that test plan for the original one?

WITNESS JONES: Not at this plant.

CHAIR KARLIN: Did anyone review the

original large transient test plan for this plant?

WITNESS PETTIS: Actually the licensee submitted, in accordance with SRP14.2.1, they submitted the testing in accordance with the SRP that defines, basically in tabular form, a comparison between the initial plant testing versus the planned EPU testing.

And the licensee makes an attempt to try to define which of those tests they need to reperform, and which ones they plan on not reperforming, as part of the EPU.

The SRP does not require that all original start-up tests be reperformed, for EPU conditions.

CHAIR KARLIN: Right.

WITNESS PETTIS: So the burden is on the licensee to go ahead and do that.

When --

CHAIR KARLIN: Well, my question is, did you review the original licensing plan that they --

WITNESS PETTIS: Yes, I did.

CHAIR KARLIN: Okay, the MSIV test that they performed way back when?

WITNESS PETTIS: Well, we asked, in the application, we asked upfront, usually in dialogue, or through the RAI process, to send in a startup test report, which is usually something that in my group we like to look at because it defines the testing that was performed, it defines testing abstracts, and it gives some idea as to what the testing was performed.

I think my response to your question might also tie in to one of the other members' question that had to do with the MSIV and generate a load reject test, asked of Entergy, about an hour ago, if in fact they were performed.

Because when we receive the startup test program, which is maybe a 300 or 400 page document, I can remember going through there, and there were some statements that talked about performing the original startup tests, which did include MSIV closure and generator load reject.

Now, those tests were performed, it appears, back around the '73, '74 time frame. I believe that back then, and I wasn't in the agency back then, but I believe back then there were some tech spec requirement to submit a startup test report to the NRC for approval, within a year after completion of the tests.

In looking at that report the high power ascension tests that were done at 75 percent and above, --

CHAIR KARLIN: So let me pause, if I understand correctly, you looked at the MSIV initial test report from the '73 or '74 initial --

WITNESS PETTIS: I looked at the report itself which encompasses all of the testing that was performed. Part of the testing that was performed was MSIV and generator load reject.

CHAIR KARLIN: The report, which report now?

WITNESS PETTIS: This is the startup test report, which is submitted to the NRC, again, approximately nine months to a year after the testing is completed. I'm not sure what we did with that test, back in that time frame, but maybe it was a validation of what had taken place.

But two of the prescribed startup tests were generator load reject and MSIV closure. However, if you read through the report, there was a statement in the report that basically indicated that the high power ascension testing, from the 75 percent to the 100 percent level, which would normally be indicative of the performance of those two tests, were suspended.

The testing was not accomplished. And I believe the statement that I think is in the Safety Evaluation Report, that I wrote under section 2.12

attributes that to fuel high riding effects.

So they had some issue with initial plant power ascension testing that precluded them from going further with the testing that would have identified the MSIV closure and the generator load reject.

So as a result it just appeared that we needed more information to at least determine the baseline testing that was performed back in the '70 time frame.

So an RAI was --

CHAIR KARLIN: Let me try to stop you there, if I can pick a pearl or so out of what you just said, but I think it is important.

So they did have the generator load rejection test, and the MSIV test was suspended, and not accomplished? Neither of them were accomplished?

WITNESS PETTIS: They had a generator load reject and an MSIV closure test planned, as part of the collective power ascension testing program. None of which was recorded, since it was never accomplished due to this fuel high riding.

So at about the 72 percent level, or 73 percent level they experienced problems on power ascension that had to do with this fuel high riding issue, which suspended further performance of the remaining high power ascension testing.

So, therefore, there was nothing in the report that said that MSIV closure would generate a load reject was performed, it just wasn't performed.

CHAIR KARLIN: So it wasn't performed?

WITNESS PETTIS: Or at least the report that I had, which was the '74 time frame just did not indicate that. So as a result we had established the dialogue, through the RAI process, to ask the licensee, and I think it was even supported by telephone calls, to provide us with the information that we need to determine whether or not these tests were performed, and to tell us, basically, more of the story.

Not that an EPU space performance of a '72 MSIV and generator load reject test would have major input into our EPU decision. But, still, we still like to go back and take a look at that.

That information did come in, there was a -- there was an extensive docketed file that came in, based upon Vermont Yankee's going back into the files. Because, again, this was 1974, some of the corporate memory I'm sure was not readily available at the time.

They pulled documents and they put a good story together, you know, regarding the power ascension testing that was performed, eventually, at full 100 percent power.

But I believe we still did not have full confirmation, or at least I can't recall the full confirmation of the MSIV closure and the generator load reject test. I'm almost positive it was reperformed.

But it may not have been reperformed at one hundred percent power. Now, back in that time frame I understand most plants, when they started up, never reached one hundred percent power in performing these particular tests.

And in some cases sent their startup test report into the agency, or even AEC back, I guess, in those days, and asked for some type of relief through the projects organization. And in most cases that relief was granted by saying that performance of these particular tests, at 72.5 percent power was acceptable.

So I don't want to leave you with the impression that every single plant in the country performed these at one hundred percent power. Some did, some didn't. But in the Staff's Safety Evaluation Report, which is probably where one of the panel members picked it up, it is in my section, I say my section, it is my sections section.

It is basically towards the end of the Safety Evaluation Report, almost to the end. Actually it is so far to the end it is almost -- it is basically right before the balance of plant, the BOP systems testing review. It is the paragraph before that.

CHAIR KARLIN: What page?

WITNESS PETTIS: Well, the version that I have is the proprietary version, which is page 272. But in there is --

CHAIR KARLIN: Well, let me ask you to pause. We have an exhibit, let's see if I have the exhibit number.

WITNESS PETTIS: Yes, I think it is exhibit 1. Actually it is page 271.

CHAIR KARLIN: Entergy exhibit number 7 is the final SER, is this what we are referring to, page 271? No?

MR. TURK: Staff exhibit 1.

WITNESS PETTIS: I thought it was one.

MR. HAMRICK: At this point we should be looking at exhibit 2 of the non-proprietary version.

CHAIR KARLIN: Okay.

WITNESS PETTIS: I understand the page

number is the same.

CHAIR KARLIN: Okay.

WITNESS PETTIS: It is the bottom of page 271, and actually what I'm describing to you, I have documented to some degree, it starts at the last paragraph, with the VY Nuclear Power Station Startup Test Report.

So if you have that paragraph it talks about --

CHAIR KARLIN: I'm not sure I do.

WITNESS PETTIS: -- reference 58.

CHAIR KARLIN: Okay. No, I don't have that. Ms. Carpentier, do you think you could pull that one for me? I guess it is Staff exhibit 2. Thank you.

Okay, Staff exhibit 2, page 271.

WITNESS PETTIS: Page 271 at the bottom. It starts out with a separate paragraph, VY NPS startup test report.

CHAIR KARLIN: Okay, I'm with you.

WITNESS PETTIS: Okay, that is where the discussion starts, and that may be where the reference, about an hour ago, came from, where one of the panel members remembered reading something about suspension of initial power ascension testing.

But it starts there and then goes to about the middle of the next page, and pretty much ends up with the fact that there was another test report, I believe, that was sent in to us. It was dated September 2nd, 1974.

That indicated that startup testing at one hundred percent power was performed in February of '75. And I believe that is the test report that may have come from General Electric as part of their warranty program.

CHAIR KARLIN: Okay, so if I understand what you are saying, it is your recollection or testimony that --

WITNESS PETTIS: It is my recollection that the two tests in question, the large transient tests, were performed above that 72, 75 percent power level. And they would be documented in that final test report.

I think at that point we went further on and didn't have a big need to go back and look at, you know, a 35 or 40 year old test report.

CHAIR KARLIN: Okay, great. That is helpful. Now, in determining -- my question is, what is the delta, what is, if any, of data qualitatively or quantitatively, that would be gathered from a transient, unplanned, and a large transient test, planned, scientists standing there with their clipboards taking data.

Is there any additional, what is the difference? Is there any additional information, qualitative, quantitative, gathered in such a test?

WITNESS PETTIS: I would have to defer to someone else on the Staff. I'm not involved in testing.

CHAIR KARLIN: Ms. Abdullahi, let's start with you. No, I want to hear from you first, if I may?

WITNESS ABDULLAHI: No, I just want to make one fast point, and I think Steve should pick it up also.

CHAIR KARLIN: All right.

WITNESS ABDULLAHI: But the point I want to make is that the nuclear Power plant is well instrumented and, therefore, you do have an operator sitting there looking at every part. Where the core is, is looking at where the water level is, where the control rods are.

So you have all this instrumentation of where the plant is, a nuclear plant cannot operate without its heartbeat being touched there, right at the --

CHAIR KARLIN: Absolutely.

WITNESS ABDULLAHI: Now, having said that, the only thing I would add, if I was doing a control test is I would make sure everything is calibrated in advance so that I would know that every instrumentation contains a certain, has been recently calibrated.

And then if I do need an additional instrumentation, then I would select those additional instrumentation.

CHAIR KARLIN: Okay, that is helpful.

WITNESS JONES: I just want to comment, based on experience inspecting test programs, and looking at other things, that a lot of that would be done in advance in developing the procedure.

They would be looking at the acceptance criteria that need to be validated. And from those acceptance criteria determine what instrumentation is necessary, whether or not the pre-installed instrumentation would provide information necessary to demonstrate the acceptance criteria had been met.

If not then it may be necessary to install temporary instrumentation, or have data logging equipment that would take readings at a more frequent interval than the process computer, or the regularly installed equipment could handle.

CHAIR KARLIN: Okay. Does anyone else have any --

WITNESS PETTIS: I might just want to add, maybe, a footnote to all of that. The regulatory process and environment usually does not afford us the luxury of being a consultant to the licensees. It is their responsibility to provide the information in the application to describe to what extent possible they are going to perform certain tests, or certain inspections, or what have you.

And then the Staff becomes somewhat of a reviewer, and technical reviewer of that information. And then, basically, approves the --

CHAIR KARLIN: Well, wait a second --

WITNESS PETTIS: -- application and the Safety Evaluation Report.

CHAIR KARLIN: Well, let me ask first. You are the regulator, you are not a reviewer, you are not a consultant, you can tell them what test you want them to perform, can't you? They give you a proposal, but you decide.

WITNESS PETTIS: I think we could, but there is always a problem of being a little too prescriptive and prescribing certain tests. Since all the plants are different, and operating conditions are different.

Because we have struggled through the same process when we developed the SRP. And the SRP14.2.1, which is exhibit 4, I believe, we struggled through that for many years, with that same question, which was basically prescriptiviness, or imposing requirements to do certain testing.

Which is why in the CPPU topical report there was basically an NRC staff position that we would review on an individual plant specific basis, the need for large transient testing, because no one can really come up with, even if they wanted to, a set of prescribed tests, in order to perform that.

The transient testing tables that were just pointed out, by Rick, and in table 1 and table 2 of the SRP, those tables are basically derived from the 1970 REG Guide 168 process. And the REG Guide 168 process is for initial plant testing, which does not one to one apply in the EPU arena.

These are operating facilities. So we are looking for, basically, a delta review for plants that have been operating, that have operating history, that have all of that data, and then granting them the EPU that basically forms that delta approach.

So when we develop the SRP the best guidance we had was our review of initial plant test programs, which are embodied into the REG guide. That is what the Staff feels is adequate, not a requirement, the licensees can propose something else.

But the REG guide process, the SRP process, their guidance documents, they are not requirements, and I just want to make sure that everyone is aware of that.

ADMINISTRATIVE JUDGE BARATTA: I think you have hit on the key point, because I think the testimony we have heard from Entergy a few minutes ago, talked about, for example, the delta in the feed system, which was more substantial, in their view, than the delta related to systems associated with NSIB.

What I would be interested in hearing is how do you assess that delta. And then what type of a process do you go through in looking at that delta to determine what should be done to satisfy the regulatory requirements for the protection of the public health and safety?

WITNESS ABDULLAHI: For clarification purposes are you asking for doing the test, or reviewing the plant response pre-EPU, post-EPU?

ADMINISTRATIVE JUDGE BARATTA: I think it is actually how do you determine, we've got the EPU. There are certain changes that are made. There are certain changes in operating characteristics that are -- an example, one hundred percent steam dump versus 80 or something, it is characteristic.

However, 120 percent is 100 percent power does not account for testing. Some equipment modifications are made, the run back on loss of the feed pump. And these are all, there is a delta there between what existed for the last, since 1974, and what exists today.

And there is an assessment process which is guided by the statements that are in the SRP that say you should consider the following, experience, etcetera, etcetera. And somehow you come to a conclusion that the MSIV and turbine trip, the delta is small enough that you don't have to do the test.

Whereas, apparently, for the changes that were made, for the condensate system, the delta was large enough that something had to be done, something more had to be done.

And what I would be interested in hearing about is what is the process by which you came to that conclusion, what facts did you take into consideration, what was the logic that was applied, in coming to the conclusion to test or not to test.

WITNESS JONES: I can address some of that especially with respect to the balance of plant systems and the load rejection tests, relative to that, the condensate test.

First of all, going back to the regulatory requirements, there is a QA program, that the licensee has, and we are looking specifically in appendix B to part 50, criterion 11, there is a test control criterion that specifies that testing be performed that is necessary to demonstrate safety related equipment will perform satisfactorily in service.

And I think it is interpreting what is necessary in that regard, where these considerations come into play. Also REG guide 1.68 mentions that in referencing appendix B, it is not intended that this is, again, Staff exhibit 4.

It is not intended that the same test requirements be established for all structures, systems, and components important to safety, a graded approach to testing should be implemented in order that adequate assurance, considering the important to safety of the item is provided that the item will perform satisfactorily while at the same time the testing is accomplished in a cost effective manner.

And that is in the discussion part of REG guide 1.68. Then in, with regard to that, the load rejection testing, for example, the considerations that come into play in that test are, from my perspective, the response to the balance of plant systems that are normally expected to respond --

CHAIR KARLIN: Could I just interrupt?

WITNESS JONES: Sure.

CHAIR KARLIN: Can you tell me where you were quoting from 1.68?

WITNESS JONES: It is the discussion section B of REG guide 1.68. It is page 1.68-2, the second, the middle of the second paragraph.

CHAIR KARLIN: Okay, thanks.

WITNESS JONES: Going back with respect to the load rejection test, as was discussed previously, we are looking for the normal systems that would be expected to respond to that transient.

At Vermont Yankee the key systems there would be one that the feed and condensate system would continue to provide cooling water to the reactor, and that the heat could be removed through the turbine bypass system.

Vermont Yankee as Entergy mentioned, previously has developed a large turbine bypass capability. So there is really no concern with regard to the effect of the EPU relative to whether or not the capacity was still adequate.

Then the previous operating experience that Vermont Yankee has had, specifically the June 2004 load rejection that occurred at the plant, demonstrated that from one hundred percent of their current, or their previously licensed thermal power, that system functioned adequately to -- for that transient.

The delta there is really relatively small. You are looking at a marginal increase in the amount of the, you know integrated amount of decay heat generated after the load rejection occurs. And it is well within the capacity of the turbine bypass system.

And then from the feed and condensate system perspective --

ADMINISTRATIVE JUDGE BARATTA: Let me stop you for a second, because I did have a question about that 2004 occurrence. In your testimony it said no significant anomalies were seen at the plant response.

This is your answer to question number 14, I think it is on page 12 of that -- page 12 of your testimony. I have the older version, so there might be a slight difference in pagination between that and the newer one.

I also was curious, you again referenced that, so I wanted to make sure that not only that there were no anomalies, but things performed as expected. Is that what you are saying by that statement?

WITNESS JONES: That is our understanding. I'm just trying to look for the exhibit that would -- if you want a specific reference I would have to --

CHAIR KARLIN: Which question was that?

ADMINISTRATIVE JUDGE BARATTA: That was question number 14, on page 12 of the Staff's testimony.

CHAIR KARLIN: I think it is on 13 now, on page 13. But the question 14 --

WITNESS PETTIS: I might add, with respect to that question 14, since my name is on there as well, that some of the Staff's evaluations that are performed, some are independent of the licensee, and others are information obtained from the licensee that we use in our review.

And also in the case of Vermont Yankee,

there were quite a few LERs, or Licensee Event Reports that were obtained by the Staff, and some submitted to us by Entergy.

Which basically, when you read those Licensee Event Reports, they have quite a bit of information in them, usually more than what you need. And some of what the Staff develops in their safety evaluation report does, in fact, bring that information forward, as opposed to the Staff doing some independent review and evaluation, reaching that conclusion.

I'm not saying that is what happened here, but I think it is.

WITNESS JONES: Certainly if you reviewed the Licensee Event Reports we considered NRC inspection of those types of events that occurs, and I was looking for the Entergy exhibit that --

ADMINISTRATIVE JUDGE RUBENSTEIN: And you concluded what?

WITNESS JONES: Excuse me?

ADMINISTRATIVE JUDGE RUBENSTEIN: You examined these reports and you concluded what?

WITNESS JONES: Concluded that there was no indication of any anomaly, or any adverse condition that made that event more severe than --

ADMINISTRATIVE JUDGE RUBENSTEIN: Based on unplanned sequences of these events --

WITNESS JONES: Right.

ADMINISTRATIVE JUDGE RUBENSTEIN: The plant performed how? Did half the control systems work, did it scram?

WITNESS JONES: Scram was expected, and the turbine bypass system functioned as designed to remove the heat, the feed and condensate system, you need to supply water to cool the reactor.

ADMINISTRATIVE JUDGE RUBENSTEIN: And in a cumulative effect of having examined all these LERs, you concluded, and you approved the request for the waiver?

WITNESS JONES: Yes.

ADMINISTRATIVE JUDGE RUBENSTEIN: And how did you balance off the factors in the SRP and 14.2.1 to come to this conclusion? I'm trying to set the stage.

(Pause.)

WITNESS JONES: In Exhibit 2, Staff exhibit 2, page 273, it has a balanced plant systems testing review. And at the bottom of that page, the last paragraph before the conclusion, we listed four criteria to evaluate the delta effect of the EPU.

One was the limited scope of the modifications. We had a list of 20 modifications. The major changes were -- Entergy mentioned, previously, the change to go from two operating main feed pumps to three operating main feed pumps.

The change in the flow rates was significant. Other than that --

CHAIR KARLIN: What page are you on, may I ask?

WITNESS JONES: Page 273 of exhibit 2.

CHAIR KARLIN: Okay.

ADMINISTRATIVE JUDGE RUBENSTEIN: I think you said that going from two to three feed pumps gave you a larger heat removal capability which exceeded that value which came from which came from the one hundred percent power.

What were the two original pumps rated at, were they 60 percent, 100 percent?

WITNESS JONES: I don't think we went by rating when we were looking at the --

ADMINISTRATIVE JUDGE RUBENSTEIN: The heat removal capacity is what I'm, the rest of my question.

WITNESS JONES: This is, really, a procedural change that the licensee elected that notified us that they would be operating the three main feed pumps, in service.

ADMINISTRATIVE JUDGE RUBENSTEIN: That added some weight. You have a cumulative decision, which approved the waiver. And what I have heard is for the balance of the plant, examination of LER and other unanticipated occurrences, did no damage.

The information that you gained was well within the licensing envelope, and it gave you a certain amount of information, and confidence, in achieving some sort of a decision.

WITNESS JONES: Right.

ADMINISTRATIVE JUDGE RUBENSTEIN: I'm interested in all of the factors in the decision. We will get to the ODYN calculations, and how well it supported your conclusion to allow the waiver to be approved.

So you are now on element 1 which there is very little change in the production of energy, based on the 20 percent, which would be effective in a transient.

Let's expand on what are the other factors you reviewed, which were part of that decision. I don't want to go back to the seven items in the SRP.

WITNESS JONES: Right, we have four specifically identified --

ADMINISTRATIVE JUDGE RUBENSTEIN: Let's hit the relevant ones.

WITNESS JONES: -- here. The first one was the scope of the modifications, and we were just discussing that. With respect to the load rejection test there was very little impact on the turbine bypass system and the feed and condensate system to respond to that type of event.

We discussed, earlier, that we didn't see any indication that there would be new thermohydraulic phenomena that would affect the response to that event, based on several LERs from other plants that have undergone this type of transient, the load rejection transient from extended power uprate conditions.

The past plant experience at Vermont Yankee specifically referenced to that June 2004 load rejection that occurred with many of the balance of plant modifications already implemented, although at the lower power, and with only two main feed pumps operating.

And then, lastly, the proposed power ascension test program, which included a lot of monitoring of a plant under steady state, and slow power ascension conditions, with regard to the feed and condensate system performing as intended, and the -- also a whole host of separate effects tests, like the tech and specification test that would check isolation of feed water if the vessel is overfilling.

And tests of other systems that would be implemented as part of the post-modification testing. And, lastly, the condensate and feed water test that was implemented as part of the license condition that demonstrated, again, proper performance in the feedwater and condensate systems to a transient, in an integrated manner, with also, you know, integrative response of all the affected control systems, the reactor run back, the recirculation control systems, the reactor pressure control system, and the feed and condensate, or feed water level control system.

ADMINISTRATIVE JUDGE RUBENSTEIN: You didn't list the last one, which is the ODYN code. What were the results of the submittal?

WITNESS ABDULLAHI: We didn't review the ODYN code.

ADMINISTRATIVE JUDGE RUBENSTEIN: Not the code itself, I say the use of ODYN in requesting the waiver, the information.

WITNESS ABDULLAHI: That would be myself and George Travans.

WITNESS THOMAS: During the --

ADMINISTRATIVE JUDGE RUBENSTEIN: Excuse me. You heard a lot of testimony and a lot of questions, by Judge Baratta, on efficiencies, or potential deficiencies in the ODYN code, and you read the Intervenor's testimony.

Why did you conclude, what weight did you give the ODYN code relative, collectively, what weight did you give the ODYN code relative to the notification that Mr. Jones listed for us?

WITNESS ABDULLAHI: Okay, in terms of large transient testing, okay, and Vermont Yankee in particular, there, from a reactor system and ODYN process-wise, there are two factors that had to be considered.

One was for large transient testing, if you do not, in fact, have a set point change, or dome pressure increase, then you did not change your SRP. So let's look at the sequence of events of MSIV closure.

If you didn't increase your set point for your SRB lift time, but they remained the same, at this point, then what will happen is when the MSIV closed, which would still, whether you input or not, you wanted them to close within that time frame of three to five seconds, the SRBs will still lift at the same pressure it was lifting pre-EPU conditions.

So you are still going to get the pressure relief so that the peak pressure would not go up. You would still get the scram but the scram will lock. So the main thing that we focus in general is, in terms of delta, is you look at the sequence of events.

And you say pre-EPU and post-EPU what are the changes that are relevant, okay? And in terms of this constant pressure changes, like if you look at the modification and the things that were done, they are on the balance of plant side.

So in terms of MSIV they do not really have that much impact. The second point to look at is, that those plants, I think one of the important factors in our decisionmaking process is, operating experience.

And you have plants who are operating 3,000 megawatt or more. And then you have the plants that are operating 1,592, is that your EPU Vermont Yankee value?

So you are using the same code for the different power levels. And you are using it to predict it for every reload. The difference between using ODYN, and Vermont Yankee EPU using ODYN, is how well is its capacity to relive itself in terms of MSIV closure.

CHAIR KARLIN: The tendency to relieve itself?

WITNESS ABDULLAHI: The pressure.

ADMINISTRATIVE JUDGE RUBENSTEIN: The pressure.

CHAIR KARLIN: I just want to make sure, relieve.

WITNESS ABDULLAHI: In essence, when you use an analytical code, okay, one thing is to talk about how it is benchmarked, and what parametrically that certainty is correct, and we quibble on that.

I mean, that is one of the big fights we usually have with the licensee and the vendor. And you go into detail on that. But when we are talking about should we subject the plant to large transient testing, then we have to look at, okay, what are the facts we have, what are the empirical methods telling us?

What are the changes in components, system, structure, that tell me that now I need to the testing. And in that process of making the decision, one factor was ODYN is used as analytical code that predicts plants that are high density power plants, you know, high power levels, and that is Brown's Ferry is indicative. But maybe the relief capacity may be even big, or it may be small.

So how that transient responds will depend on that particular plant's extra features. But can the code do the analysis? Yes, it can do the analysis. If it did for Vermont Yankee, if you did it for Hatch, or Grand Gulf, reload analysis for 20 years, it can handle Vermont.

Another option to look at, that we considered was let's look at Hatch, compare and you have the data of Hatch. Hatch had EPU 13 percent power. It has -- you have a comparison between the two.

And those comparison Hatch two went on 113 percent original license thermal power, had an inside enclosure.

ADMINISTRATIVE JUDGE RUBENSTEIN: Keep going.

WITNESS ABDULLAHI: I think summarizing that Hatch --

ADMINISTRATIVE JUDGE RUBENSTEIN: I'm very interested in this.

WITNESS ABDULLAHI: -- look at actual EPU transient experience by EPU plants were relevant to us in our decisionmaking process.

Because you have Brunswick that was 120 percent power. You had Hatch that went to 113 percent power. If it experience at flux scram, and you had peak went up, SRB went out, you know, dumped, lose the steam, scram occurred, everything happened as designed, and as expected, then we are in a way, regulatory wise, that is an important decisionmaking contributor.

And those specific plants that have experienced those transient, if you compare it to Vermont Yankee, Hatch MSIV 113 percent original license thermal power, had a scram on high flux, and what you get is that you compare the two plants, and that will give you an idea of how far off, what is the delta, what am I looking for? Why do I need to subject the plant to a transient when I know it is more than frequency transient, it will occur.

But why do I need to subject it? Now, if the intention is do I need to do the large transient testing and do I have sufficient information, and contributing information to make my decision, operating reactor, all the things that Steve had mentioned were the main contributor.

Now, if we are talking about is the code, is the actual code benchmarked accurately, parametrically, and uncertainty extremely correct, or would we have enough conservatism, that is a different issue.

And we go through that process periodically. And it is part of our review process within the NRC. But in the realm of large transient testing, ODYN is not the issue. The most important part for us is the operating experience.

ADMINISTRATIVE JUDGE RUBENSTEIN: Thank you very much, very elucidating.

CHAIR KARLIN: All right, I think Ms. Abdullahi, you get the last word for the evening. So we are going to adjourn, thank you.

We will -- thank you, you have all been quite patient and waiting all day to speak, and we will still have some questions for you tomorrow. But I appreciate all of the witnesses, the witnesses from Entergy, and the Staff. And I know witnesses from NEC is standing by.

So with that we will stand adjourned. We are going to convene tomorrow at nine a.m., sharp, here. We hope to get through as much as we can tomorrow, maybe even complete it.

Any last questions by any of the counsel?

Mr. Shadis?

MR. SHADIS: Yes, thank you Your Honor. Many of the exhibits that were offered today we received only in electronic form, and with indeces that did not match, the indeces that were provided today, or the exhibit designations.

And it has caused us some confusion in trying to locate them on the computer, locate the few that we have copied and marked as they were originally marked.

It would be helpful to us if the licensee, and the NRC, would provide us the new amended exhibit lists so that we could correlate all these documents.

CHAIR KARLIN: Well, I think they filed those, did they not? Pursuant to my order, our order on September 6th. Was there not an exhibit list that you filed with us?

MR. TURK: The Staff did, Your Honor, and we did serve Mr. Shadis. We have an extra copy we can give him.

CHAIR KARLIN: There was, and Entergy --

MR. TRAVIESO-DIAZ: We did likewise, and I think it was even before September 6th.

CHAIR KARLIN: Yes, I think yours was filed earlier, and it was an exhibit list with the new numbers, the new numbering system. And you served Mr. Shadis with that, Mr. Travieso-Diaz?

MR. TRAVIESO-DIAZ: Pardon me?

CHAIR KARLIN: Mr. Shadis got a copy of that earlier, didn't he?

MR. TRAVIESO-DIAZ: Yes. In any event we do have a set of exhibits that we could provide, if that is what he needs.

CHAIR KARLIN: All right, so please give him another copy, a hard copy if you could.

MR. SHADIS: Thank you, I appreciate that.

CHAIR KARLIN: Would you do that this evening, before we leave?

Okay, with that we are adjourned until tomorrow at nine a.m. Thank you all.

(Whereupon, at 6:02 p.m., the above-entitled matter was adjourned, to be resumed Thursday, September 14th, at 9 a.m.)

CERTIFICATE

This is to certify that the attached proceedings before the United States Nuclear Regulatory Commission in the matter of:

Name of Proceeding: Entergy Nuclear Vermont Yankee, LLC and Entergy Nuclear Operations, Inc. Hearing

Docket Number: 50-271-OLA

Location: Newfane, Vermont

were held as herein appears, and that this is the original transcript thereof for the file of the United States Nuclear Regulatory Commission taken by me and, thereafter reduced to typewriting by me or under the direction of the court reporting company, and that the transcript is a true and accurate record of the foregoing proceedings.

Crissy Willis
Official Reporter
Neal R. Gross & Co., Inc.