

January 4, 2000

**UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION**

Before the Atomic Safety and Licensing Board

In the Matter of

**CAROLINA POWER & LIGHT
COMPANY**

(Shearon Harris Nuclear Power Plant)

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Docket No. 50-400-LA

ASLBP No. 99-762-02-LA

**EXHIBITS SUPPORTING THE
SUMMARY OF FACTS, DATA, AND ARGUMENTS
ON WHICH APPLICANT PROPOSES TO RELY
AT THE SUBPART K ORAL ARGUMENT**

VOLUME 6

EXHIBIT 11

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NUCLEAR REGULATORY COMMISSION

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CAROLINA POWER & LIGHT
COMPANY
(Shearon Harris Nuclear
Power Plant)

Docket

No. 50-400-LA

ASLBP

No. 99-762-02-LA

DEPOSITION OF
GORDON THOMPSON, PH.D.

DISK
ENCLOSED

At Raleigh, North Carolina
October 21, 1999
9:40 AM to 4:14 PM
Reported by: Melody L. Rife, RPR

COPY

CRS

Court Reporting Services (919) 832-4114 (800) 289-1017 FAX (919) 832-4181

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EXHIBITS

4

EXHIBIT NO.DESCRIPTIONMARKED

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Thompson No. 1

Notice of Deposition
of Dr. Gordon
Thompson

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Thompson No. 2

CV of Gordon R.
Thompson, dated
July 1999

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Thompson No. 3

Minutes, Orange
County Board of
Commissioners,
February 9, 1999,
with presentation
from Gordon Thompson,
and meeting agenda

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Thompson No. 4

Testimony of Gordon
Thompson, In the
Matter of Vermont
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Thompson No. 5

Rebuttal Testimony of
Gordon Thompson, In
the Matter of Vermont
Yankee, dated June 9,
1989

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Thompson No. 6

Declaration of Gordon
Thompson, In the
Matter of Carolina
Power & Light, dated
February 12, 1999

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Thompson No. 7

Transcript, Lacey
Township Board of
Adjustment, In Regard
to the Matter of Jersey
Central Power and Light,
dated June 5, 1995

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Thompson No. 8

Declaration of
Dr. Gordon Thompson,
In the Matter of
Carolina Power & Light,
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Thompson No. 18

Letter regarding
Shearon Harris Nuclear
Power Plant,
Supplemental
Information Regarding
License Amendment
Request, dated
October 15, 1999

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* * * * *

2
3 S T I P U L A T I O N S

4 It is hereby stipulated and agreed
5 between the parties to this action, through
6 their respective counsel of record:

7 1. The deposition of Gordon
8 Thompson, Ph.D., may be taken on October 21,
9 1999, beginning at 9:30 AM, at the offices of
10 Carolina Power & Light Company, Fayetteville
11 Street Mall, Central Plaza Building, 13th
12 Floor, Raleigh, North Carolina, before
13 Melody L. Rife, Registered Professional
14 Reporter and Notary Public.

15 2. Any objections of any party
16 hereto as to notice of the taking of said
17 deposition or as to the time or place thereof,
18 or as to the competency of the person before
19 whom the same shall be taken are deemed to have
20 been met.

21 3. Said deposition shall be taken
22 for the purpose of discovery or for use as
23 evidence in the above-entitled action or for
24 both purposes.

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4. Objections to questions and motions to strike answers need not be made during the taking of this deposition, but may be made for the first time during the progress of the trial of this case, or at any pretrial hearing held before any judge for the purpose of ruling thereon, or at any other hearing of said case at which said deposition might be used, except that an objection as to the form of a question must be made at the time such question is asked or objection is waived as to the form of the question.

5. The original of this deposition will be mailed to the appropriate party. Notice of filing is hereby waived.

6. Deponent reserves the right to read and sign the deposition.

* * * * *

2
3 Thereupon, the following proceedings
4 were had:

5 * * * * *

6 (Thereupon, a discussion was held off
7 the record)

8 DR. HOLLOWAY: I also ask that you
9 transcribe everything during the
10 deposition, except during breaks and when
11 we go off the record, when nothing should
12 be transcribed. And please interrupt, if
13 it's necessary, to clear up any doubt
14 about a question or answer.

15 THE COURT REPORTER: Thank you.

16 DR. HOLLOWAY: I'd like you to mark
17 exhibits prior to commencing examination,
18 so we have that clear.

19 (Thereupon, a discussion was held off
20 the record)

21 * * * * *

22 Thereupon,

23 GORDON THOMPSON, PH.D.

24 having first been duly sworn, was examined and
25 testified as follows:

2

3

* * * * *

4

EXAMINATION BY DR. HOLLAWAY:

5

Q. Dr. Thompson, I'm Dr. Hollaway, an attorney representing Carolina Power & Light in this proceeding.

6

7

8

Have you been deposed before?

9

A. Yes.

10

Q. Then, you're aware of how a deposition works.

11

12

A. In general terms, yes.

13

Q. If at any time you wish to take a break, please speak up, we'll do that.

14

15

If you don't understand something that I say, please speak up, and I'll clarify it. If you don't ask for clarification, I'll assume you understand the question.

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And I'm sure you're well aware that your answers must be truthful and that there would be serious consequences if they were not.

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A. Yes.

25

Q. You understand that this deposition is

2
3 being transcribed.

4 A. Yes.

5 Q. And when the transcription is completed,
6 you will have an opportunity to read it
7 and make any corrections and sign it.

8 A. Yes.

9 DR. HOLLAWAY: I'll ask the court
10 reporter to mark as Exhibit 1 document
11 entitled Notice of Deposition of
12 Dr. Gordon Thompson, consisting of four
13 pages.

14 (Thereupon, Thompson Exhibit No. 1
15 was marked for identification)

16 Q. Dr. Thompson, have you seen this document?

17 A. Yes.

18 Q. Document instructs you to produce at this
19 deposition documents which you have relied
20 on or which you intend to rely on for your
21 positions that have not already been
22 produced to CP&L?

23 A. Yes.

24 Q. Do you have any documents with you to
25 produce at this time?

2

3 A. No.

4 Q. I went through the documents that were
5 produced by BCOC, and there were very few
6 that went to Contention 2; and my
7 understanding is that you are the expert
8 for Contention 2. Is that correct?

9 A. Yes.

10 Q. There weren't many documents there. Is
11 there anything else?

12 A. Nothing at present, no. But my
13 understanding is that we -- Orange County
14 will produce a brief for a document of
15 this kind, and I assume that I will
16 contribute to this document.

17 Q. And when would that be completed?

18 A. By the filing deadline, which I don't
19 recall at present.

20 Q. Okay, so I just want to make sure I
21 understand. The world of documents that
22 you will rely on is what has been produced
23 to CP&L by BCOC, as well as all those
24 documents that CP&L has produced to BCOC;
25 is that correct?

2

3 A. And documents from the staff.

4 Q. Okay.

5 A. I'm assuming that -- that's already
6 covered.

7 Q. I understand.

8 A. Right.

9 Q. So documents that BCOC has produced,
10 documents that CP&L has produced, and
11 documents that the staff has produced or
12 will produce.

13 A. Right.

14 One point of clarification. It is
15 possible that in the course of preparing
16 my contribution to this brief, or whatever
17 it is called, that I will cite publicly
18 available literature: Handbooks or
19 journal articles, material of that nature.

20 Q. What sort of publicly available literature
21 or articles would there be?

22 A. At this point I don't know. But if -- if
23 I made any such citation, it would be to
24 material that was generally available.

25 Q. Okay. Now are you searching for such

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things?

A. At present, yes, I'm --

Q. Okay.

A. -- looking for that sort of document.

Q. Have you identified anything yet?

A. I intend to get the American Nuclear Society standards on criticality, and I don't have those in my files as of yet.

Q. Okay. Anything else?

A. Nothing that I'm actively looking for at present.

Q. Okay.

When were you retained by BCOC with respect to this proceeding?

A. My recollection is January, but it may not be exact. I'd have to consult my files.

Q. Of what year?

A. This year, 1999.

Q. Okay. And what is your role with respect to this proceeding, as you understand it?

A. To provide technical and safety advice to the County pursuant to its intervention in the license application for the fuel

2

3 expansion, working with Attorney Curran,
4 who works for the County, also.

5

Q. Do you understand that in this proceeding,
6 Counsel has filed a pleading stating that
7 you will be an expert with respect to
8 Contention 2 only?

9

A. Yes, I understand it.

10

Q. Okay.

11

Are you being compensated to be here
12 today?

13

A. Yes.

14

Q. And who is paying you?

15

A. Directly, my employer, the Institute for
16 Resource and Security Studies. In turn,
17 they are compensated by Orange County.

18

Q. How much is the Institute for Resource and
19 Security Studies being compensated for
20 your work here today?

21

A. My time is billed at an hourly rate, and
22 whatever that adds up to.

23

Q. What is that hourly rate?

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A. Hundred and twenty-five dollars per hour.

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Q. How many hours do you expect to spend

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today?

A. That's up to you.

Q. Okay. How much has the Institute been paid to date with respect to your work in this proceeding?

A. I'd have to guess; and I'd say twenty thousand dollars.

Q. How much do you --

A. But that's -- that's a very rough guess, because I don't carry that sort of information in my head.

Q. Okay. How much do you expect to be paid ultimately for your work in this proceeding?

A. That's not possible to estimate, because we're in a phase, two technical contentions, and there may be an extra phase with environmental contentions; so it's a very open-ended matter.

Q. Assume that the only contentions were the two technical contentions. How much would you expect to be paid for your work if that were the scope?

2
3 MS. CURRAN: Objection. It calls for
4 speculation.

5 THE WITNESS: Yeah. It's not
6 possible to estimate at present.

7 Q. Assume that there are only two technical
8 contentions and that this case ends after
9 the subpart (k) oral argument. How much
10 do you expect to be paid for your work in
11 this proceeding?

12 A. That's -- that's a speculation.

13 Q. Do you have any idea how much work you'll
14 be doing between now and January 4th on
15 this proceeding?

16 A. All hours, outer limit, that would be the
17 number of workdays between now and
18 January 4th. That would be the upper
19 limit.

20 Q. Is that a reasonable estimate of the time
21 you'll spend on this?

22 A. It would be some time less than that.

23 Q. You estimate how much less?

24 A. As I say, that's a speculation; and I
25 don't believe I can give an accurate

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answer to a speculative question.

4

Q. When you say "all hours," I would assume
5 waking hours, eight hours a day. Is
6 that --

7

A. Yes.

8

Q. Okay.

9

10

Okay. What role do you have in the
Institute for Resource and Security
11 Studies?

12

13

A. I'm the executive director; and I perform
14 work on energy and environment issues that
15 is not done by consultants, Institute's or
16 employees' consultants, from time to time
on these subject areas.

17

18

Q. How many full-time employees does the
Institute have?

19

A. Two.

20

Q. Are you one of the two?

21

A. Yes.

22

Q. Are you paid a salary by them?

23

A. Yes.

24

Q. Does the salary depend on how much money
25 is earned from this proceeding?

2

3 A. Yes.

4 Q. Okay.

5 A. My work is mostly project work, so it's
6 funded on a project basis.

7 Q. Okay. So the more a proceeding brings in,
8 the more you'd be paid, or vice versa; is
9 that right?

10 A. The more a project brings in, yes.

11 Q. Okay.

12 A. Just for point of information, some of our
13 projects are grant-funded; some are done
14 on a fixed fee; and some, like this one,
15 are paid on an hourly basis.

16 Q. Okay.

17 I have a book here in front of me,
18 Nuclear Waste Disposal, Crisis, authored
19 by David A. Lochbaum, published in 1996.

20 I haven't had copies made because
21 it's a copyrighted book.

22 A. Right.

23 Q. Are you familiar with this book?

24 A. Yes. I possess a copy.

25 Q. You have a copy of the book?

2

3 A. Right.

4 Q. Do you agree with the findings of this
5 book?

6 A. I find it a generally useful book that I
7 found to contain generally accurate
8 information. I would not necessarily
9 support all of the findings and
10 recommendations.

11 Q. Any findings or recommendations that you
12 know of that you don't agree with in
13 Mr. Lochbaum's book?

14 A. I don't recall any at present.

15 DR. HOLLAWAY: I'll ask the court
16 reporter to mark as Exhibit 2 the
17 curriculum vitae of Gordon R. Thompson
18 dated July 1999.

19 (Thereupon, Thompson Exhibit No. 2
20 was marked for identification)

21 Q. Dr. Thompson, have you seen this document
22 before?

23 A. I wrote it.

24 Q. So you authored this.

25 A. Yes.

2

3 Q. Are the statements in here truthful?

4 A. Yes.

5 Q. This states that you have a Ph.D. in
6 applied mathematics?

7 A. Correct.

8 Q. What does that relate to?

9 A. The work was in the -- the theory of
10 high-temperature plasmas. So it could be
11 considered theoretical physics, but it
12 happened to be done through the math
13 faculty.

14 Q. Can you tell me what courses you have
15 taken in fission reactor engineer?

16 A. None.

17 Q. Can you tell me what courses you've taken
18 in fission reactor criticality control?

19 A. None.

20 Q. Okay. What training have you had in
21 fission reactor criticality analysis?

22 A. None.

23 Q. Are you an expert in fission reactor
24 criticality analysis?

25 A. For the purpose of this proceeding, yes.

2

3 Q. On what basis do you state that?

4 A. My contribution to the -- to this
5 proceeding relies on my basic expertise in
6 scientific principles and analytic
7 principles and my general experience with
8 engineering in general and nuclear plant
9 engineering in specifics.

10 Q. So when you assert that you're an expert
11 in fission reactor criticality analysis,
12 that would be in the general scientific
13 principles attendant to criticality?

14 A. The brief that -- to which I will --
15 that -- my contribution to Orange County's
16 brief will rely upon expertise that I
17 possess.

18 Q. Could you answer my question?

19 THE WITNESS: Could you read it back?
20 (Thereupon, the question beginning on
21 page 21, line 10, was read by the
22 court reporter)

23 A. Yes, and on the application of those
24 principles to the contention.

25 Q. Okay.

2

3

Tell me what criticality analysis codes you have run yourself.

4

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A. I have not run any, as such.

6

Q. Okay. Can you tell me what training you've had in running criticality analysis codes?

7

8

9

A. None.

10

Q. Okay. What codes are used to perform fission reactor criticality analysis?

11

12

A. Codes that are identified in the CP&L application and in the subsequent correspondence, response for the request for additional information.

13

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I don't remember the names of those codes. And I should say as a point of clarification that I don't expect to run or seek to have run any of those codes in connection with this proceeding.

17

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Q. Okay, so you have not run any criticality analyses yourself for this proceeding?

22

23

A. Correct, and do not anticipate doing so or having this done.

24

25

Q. Okay. Are you competent to evaluate the

2

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results of a criticality analysis?

4

A. Yes.

5

Q. If you've never been trained in running

6

the codes, have not run the codes

7

yourself, how can you evaluate whether the

8

analysis itself is correct?

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A. In evaluating an analysis, there are two

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primary aspects to the evaluation. One is

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to -- given the assumptions on the line

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analysis, to assess the analysis that was

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performed pursuant to those assumptions.

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The other aspect is to examine the

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assumptions and assess whether those

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assumptions are sufficient to address the

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issues that might be of concern in

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connection with criticality.

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I -- in the course of this

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proceeding, I will expect to confine my

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assessment primarily and perhaps totally

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to the assessment of assumptions and their

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adequacy.

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Q. So you've identified two aspects here.

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The first one is sufficiency of the

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assumptions --

A. Right.

Q. -- second is given those assumptions, the analysis itself.

A. Correct.

Q. You believe that you're competent to address the sufficiency of the assumptions; is that correct?

A. Yes.

Q. Do you have the expertise to address the second part, whether -- given those assumptions are valid, that the analysis done after it is in fact correct and valid?

A. Not without doing a lot of studying. As of this moment, no, I am not competent to do that.

Q. Okay. Do you anticipate doing that?

A. Not over the time frame of this proceeding.

Q. Okay.

Dr. Thompson, are you licensed as a nuclear power plant operator?

2

3 A. No.

4 Q. Have you ever been licensed as a nuclear
5 power plant operator?

6 A. No.

7 Q. Have you been trained to operate a nuclear
8 power plant?

9 A. No.

10 Q. Have you been an engineer at a nuclear
11 power plant?

12 A. No.

13 Q. Have you ever implemented procedures at a
14 nuclear power plant?

15 A. No.

16 Q. Have you ever written procedures for a
17 nuclear power plant?

18 A. No.

19 Q. Have you ever worked at a nuclear power
20 plant?

21 A. No.

22 Q. Are you an expert in nuclear power plant
23 operations?

24 A. No.

25 Let me -- let me correct that frame.

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I have performed studies and presented testimony relating to the safety of nuclear facilities, including nuclear power plants; and in the course of those studies and preparing those testimonies, I have become expert in operational matters pertinent to the analyses and testimony. So in that limited sense, I am an expert in operations. It's a very circumscribed sense.

Q. Okay. Could you define what those areas are that you got the limited expertise in?

A. Let's take the present proceeding and Contention 2. I'm now familiar in a general sense with the configuration of the Harris Fuel Building and its equipment, and in a general sense, with the procedures used to manage fuel. I may acquire additional knowledge on these matters prior to the filing.

Q. You say you're familiar in a general sense.

MS. CURRAN: Excuse me. Before we go

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3

on with the next question, I'd like to
take a short break.

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5

DR. HOLLOWAY: I'd like to finish the
next couple questions that go directly to
the question that he just responded to and
I'd be happy to take a break, if that's
okay.

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MS. CURRAN: Okay.

11

Q. You said you're familiar in a general
sense with the equipment at the Harris
plant. What is that familiarity based on?

12

13

14

A. Based on -- I think I said the fuel
handling building.

15

16

Q. Fuel handling building.

17

A. To date, that's based on review of the
FSAR and other documents provided by CP&L
and deciphers of yesterday.

18

19

20

Q. Okay. When you state --

21

A. -- and --

22

Q. Oh.

23

A. Correction -- and with some additional
information obtained from the deposition
yesterday of Mr. Devoe.

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Q. Okay.

You state you're familiar in a general sense with the procedures for the fuel handling building. What's that based on?

A. Again, the same data source that I just described.

Q. Okay.

A. Data set.

Q. Your familiarity is just in a general sense, it is not from actual application?

A. That's correct. Nor would I claim to be familiar with all of the procedures used in fuel management at Harris.

Q. Okay. And even the ones that you've read or heard about, you have not actually applied yourself.

A. Correct, correct.

Q. Have you seen them applied?

A. No.

Q. Okay.

DR. HOLLOWAY: Diane, if you'd like to take a break, it will be fine.

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MS. CURRAN: Okay.

DR. HOLLAWAY: How long do you want?

MS. CURRAN: Five minutes.

(Thereupon, a break was taken at
10:05 AM, with proceedings
recommencing at 10:12 AM)

THE WITNESS: I'd like to clarify one
of my previous statements. Is that okay?

DR. HOLLAWAY: Yes; go ahead.

THE WITNESS: You asked about my
expertise in nuclear plant operations.

DR. HOLLAWAY: Yes.

THE WITNESS: And I stated that I
have performed many studies and presented
numerous pieces of testimony pertaining to
the safety of nuclear facilities. This
goes back into the 1970's. So I've become
familiar with details of numerous
facilities, nuclear power plants and other
nuclear facilities, in several countries.
And I have always taken pains to acquire
the necessary familiarity with the details
of the design and operation of each

2
3 facility in order to support whatever
4 claim I made in my study or testimony.

5 DR. HOLLAWAY: Okay.

6 THE WITNESS: And that's typically
7 not the same as the -- as the level of
8 operational familiarity that one would
9 require as an operator or manager of such
10 a facility. It's a sufficiency of
11 knowledge and expertise to support
12 whatever claim about safety is made in the
13 study or testimony.

14 And in this proceeding, I will expect
15 to meet the same standard, that any claim
16 that I make will be supported by
17 sufficient expertise and familiarity with
18 the design and procedures and operational
19 characteristics of the Harris plant.

20 DR. HOLLAWAY: Okay.

21 Q. Your ability to speak on these issues I
22 gather would depend on what the specific
23 issue was?

24 A. I -- yes, with the clarification that I
25 have on various occasions become --

2
3 acquired knowledge and expertise that I
4 didn't -- did not possess up to that
5 point --

6 Q. Okay.

7 A. -- in the realm of nuclear safety.

8 Q. Your familiarity with design and
9 operations of a facility, outside of your
10 description of time in the fuel handling
11 building, would be based on reports you've
12 read, documents you've read; is that
13 correct?

14 A. And on applications of general physical
15 principles.

16 Q. Okay. When you say "application of
17 general physical principles," you're
18 talking about theoretical application, not
19 physically doing things, is that correct,
20 yourself physically doing things?

21 A. I -- yes.

22 Q. Okay. And you say your expertise would
23 not be the same as an operator or manager
24 of a nuclear power plant. I presume that
25 would include workers, technicians,

2
3 et cetera that are actually working at the
4 facility.

5 A. Yes.

6 Each -- each such person has a
7 particular realm of expertise, and there's
8 only so much you can do in one life.

9 But I emphasize that I'm always very
10 careful to support my claims and findings
11 with knowledge about the underlying --
12 about relevant matters underlying those
13 findings.

14 Q. That's certainly laudable.

15 How much time did you spend in the
16 Harris Fuel Handling Building?

17 A. The site visit lasted about two hours, I
18 recall; so maybe an hour in the building.

19 Q. Okay. Does that hour in the building make
20 you an expert on the fuel handling
21 building?

22 A. It mostly confirmed the general
23 understanding I obtained from the FSAR.

24 Q. Okay; layout of where things were,
25 et cetera.

2

3 A. Right.

4 Q. Okay. Have you been in other fuel
5 handling buildings at other facilities?

6 A. Darlington; Main Yankee; Dukovany; and
7 TMI, Unit 2.

8 Q. Where is the Darlington plant located?

9 A. Canada, in the province of Ontario.

10 Q. Okay. Is that a pressurized water reactor
11 like Harris?

12 A. No.

13 Q. TMI, Unit 2; when were you there?

14 A. In the '79-80 period. I don't recall
15 exactly. 1- -- 1980.

16 Q. It was after 1979.

17 A. Yeah.

18 Q. What type of reactor is Main Yankee?

19 A. PW- -- it -- I don't recall the vendor.

20 Q. And what were you doing in the fuel
21 handling building there and for how long?

22 A. It was a site visit in connection with an
23 intervention by the State of Maine.

24 Q. What year was that?

25 A. I think 1981.

2

3 Q. How long were you in that fuel handling
4 building?

5 A. Maybe an hour.

6 Q. Dukovany; what type of reactor is that?

7 A. Czech Republic, for PWR units, Russian
8 design.

9 Q. Russian design?

10 A. Soviet design.

11 Q. Okay. Is there an acronym that that goes
12 by?

13 A. The -- the Russian for PWR is VVR.

14 Q. VVR?

15 A. Any pressurized water reactor.

16 Q. Okay.

17 What were you doing in the fuel
18 handling building there?

19 A. I was representing the investor, Vienna,
20 which in turn represented the Chancellor's
21 Office of Austria, which was concerned
22 about safety of fuel management at
23 Dukovany, which is a neighboring country.

24 Q. What year were you there?

25 A. 1992.

2

3 Q. How long were you in the fuel handling
4 building?

5 A. In about an hour.

6 Q. Okay.

7 You mention that part of your
8 expertise is based on sitting in on
9 Mr. Devoe's deposition yesterday; is that
10 correct?

11 A. That's a contribution to it, yes.

12 Q. Okay.

13 A. The contribution to my knowledge, rather
14 than expertise.

15 Q. Very good. How long were you in that
16 deposition?

17 A. I'd guess about two hours.

18 Q. And did what you learned in Mr. Devoe's
19 deposition substantially increase your
20 knowledge on these issues?

21 A. No; it was a comparatively minor increase
22 in knowledge. There were lots of loose
23 ends left unresolved.

24 Q. Can you approximate, I guess
25 percentage-wise? Is it, like, a fifty

2

3 percent increase in knowledge?

4 A. Oh, no; much less.

5 Q. One percent?

6 A. Less.

7 Q. Less than one percent?

8 A. Hard -- hard to say, but small. I --

9 Q. Okay. I mean --

10 A. It's not a matter that's susceptible to
11 numerical estimate.

12 Q. But it's less than fifty percent?

13 A. Yes.

14 Q. Okay; less than twenty-five percent?

15 A. Probably, but I wouldn't give a number on
16 that.

17 Q. Okay.

18 You have stated that you will address
19 and do understand assumptions that go into
20 criticality analysis.

21 A. Correct.

22 Q. Okay. Even if you don't actually do the
23 criticality analysis yourself --

24 A. Correct.

25 Q. -- the assumptions you can address.

2

3 A. Correct.

4 Q. Okay.

5 Referring to your curriculum vitae,
6 which is a lot of pages, on page 1 it
7 addresses sponsors and tasks.

8 A. Correct.

9 Q. Aside from the Orange County, North
10 Carolina, which I understand to be the
11 present proceeding, which of these dealt
12 with your evaluation of assumptions used
13 in criticality analysis?

14 A. None of these so far.

15 Q. Okay.

16 On page 4 your CV lists publications.
17 Aside from the first one, which is this
18 proceeding, which of these publications
19 address assumptions used in criticality
20 analysis?

21 A. None so far.

22 Q. On page 8 there are expert presentations
23 and testimony?

24 A. Correct.

25 Q. Which of these address assumptions used in

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criticality analysis?

A. None.

Q. Okay.

Can you explain to me how criticality is controlled for fission reactor fuel in a spent fuel pool?

A. It can be controlled by the spacing of the fuel assemblies; by the placement of neutron-absorbing material, such as boral, between fuel assemblies; by the addition of boron to the water surrounding the fuel assemblies; and by confining placement of fuel assemblies to those which meet some specified combination of enrichment and burn-up. Those are four possible options for controlling criticality in fuel that is placed in a rack.

Q. Okay. Can you describe for me the history of development of criticality control methods for spent fuel pools?

A. In the early years of United States nuclear industry, pools employed low-density racks; and the spacing in

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2
3 those racks was sufficient to preclude
4 criticality without any other provision.
5 As time went by and the inventory of spent
6 fuel increased at power stations, the
7 racks were reconfigured to bring the
8 assemblies closer together. That -- to --
9 that created the potential for
10 criticality, which was first addressed by
11 the introduction of neutron-absorbing
12 materials and placed between fuel
13 assemblies, and also by the introduction
14 of boron into the water, and more
15 recently -- and it appears to me that it's
16 basically an issue of the '90's -- by
17 reliance upon restrictions of burn-up and
18 enrichment.

19 So in the present state of the U.S.
20 nuclear industry, some plants rely on all
21 four measures in routine operation, some
22 rely on less than all four.

23 And my understanding is that in this
24 application for Pools C and D, CPL [sic]
25 tends to rely upon three of those four

2
3 measures.

4 Q. Which three?

5 A. Spacing, solid neutron-absorbing material,
6 and limitations of burn-up and enrichment.

7 My understanding, that in normal
8 operation, there is no intent to rely upon
9 boron in the water. Only in accident
10 conditions is there reference to the role
11 of boron in the water in suppressing
12 criticality.

13 Q. The use of burn-up and enrichment limits,
14 you stated that that's something that you
15 believe is in the -- has started in the
16 1990's?

17 A. My review of the history of -- of this
18 issue to date indicates that it's -- it's
19 the trend of the '90's. It was, however,
20 foreseen by the NRC considerably earlier,
21 back in the '70's.

22 Q. When in the '70's? What do you base that
23 on?

24 A. It's mentioned in a 1978 generic letter by
25 the NRC staff.

2

3 Q. What's mentioned there?

4 A. The option of using controls on burn-up
5 and enrichment as a criticality control
6 measure.7 Q. But at that time no one was implementing
8 such measures.

9 A. As far as I know, that's correct.

10 Q. You stated originally that low-density
11 racks were used. What time period would
12 that be?13 A. There was also some decrease in spacing
14 during that period. Some of the early
15 racks were 20-inch spacing, and then they
16 went to 16-inch, which you can sort of
17 guard as low-density, open configuration
18 without boral or Boraflex panels.19 The -- roughly the '80's is the time
20 when high-density fuel storage began, very
21 roughly. It's a plant-specific thing.22 Q. So in the '60's or '70's, you'd be seeing
23 low-density racks; is that correct?

24 A. Right, right.

25 Q. And at that time, '60's, '70's, of the

2
3 four measures you've described, the only
4 one that was being used was --

5 A. Yes.

6 Q. -- were low-density racks?

7 A. Generally speaking, right. There are --
8 there are always exceptions, and I think
9 that maybe GE in Illinois may have had
10 relatively high density early on; but --

11 Actually, that's a place I've been
12 to, another spent fuel storage facility,
13 that I have forgotten.

14 Q. What is it?

15 A. It's a reprocessing plant that was built
16 by General Electric that was never opened.

17 Q. Okay.

18 A. And there are spent fuel pools at that
19 facility at which I have toured.

20 Q. It's a nuclear power plant?

21 A. No, it's not. But the --

22 Q. What is it?

23 A. It's -- it's a reprocessing plant that was
24 never opened.

25 Q. Okay.

2

3 A. And associated with that, spent fuel
4 pools.

5 Q. Okay. What year were you there?

6 A. I think around 1981.

7 Q. Do you know what provision of the
8 regulations that facility is regulated
9 under?

10 A. It -- it was certainly a licensed
11 facility, but not a power plant.

12 Q. Under NRC regulations?

13 A. Yes.

14 Q. Not a power plant.

15 A. Right.

16 Q. Okay.

17 You stated that boron in the water is
18 something new. When would that have
19 started?

20 A. Again that's -- that's covered by the '78
21 generic letter.

22 Q. Okay.

23 A. And at present I don't know when that was
24 first introduced, and that's something I
25 hope to find out fairly soon.

2

3 Q. Prior to that time, the pools would not
4 have had boron in them?

5 A. As I say, I don't know when boron was
6 first introduced --

7 Q. Okay.

8 A. -- or it worked. That was an -- I wish to
9 know that history --

10 Q. Okay.

11 A. -- both in terms of practice and
12 regulatory requirements, which are not
13 always the same thing.

14 Q. Okay. And that boron in the water is used
15 for spent fuel pool criticality control;
16 is that correct?

17 A. Yes.

18 Q. Okay.

19 A. But, of course, the -- during refueling
20 operations, you connect to the reactor.
21 And so, as I think about it, there's a
22 practical convenience in having boron in
23 the pools, because during refueling
24 operations, you're in communication with
25 the reactor.

2

3 Q. Okay.

4 A. So ... you'd expect, therefore, to have
5 boron in the pools from fairly early on.

6 Q. Okay. What do you mean by "fairly early
7 on"?

8 A. That -- perhaps from the beginning of
9 plant operation.

10 Q. Okay.

11 A. But I'm -- I'm speculating a bit here.

12 Q. Okay, it's -- that's not something that
13 you know.

14 A. No, not at present.

15 Q. Not in your position.

16 A. At present.

17 Q. Okay.

18 You've identified four measures for
19 criticality control and spent fuel pools.
20 Are you aware of any others?

21 A. I believe I mentioned these measures are
22 applicable when fuel is in a rack --

23 Q. Yes.

24 A. -- is in a position in a spent fuel rack.

25 During fuel movement, of course you

1
2
3 have to have other provisions to prevent
4 fuel assemblies from approaching each
5 other.

6 There -- there are limits in the tech
7 spec, limit the total enrichment of fuel
8 permitted on the facility; so you might
9 consider that another measure.

10 Q. That would be a fifth measure?

11 A. Yes.

12 Q. Okay.

13 A. But in practice, the enrichment is
14 typically below the tech spec limit for
15 the fresh fuel. So it's -- it's more of a
16 generic override in requirement rather
17 than a practical limit.

18 Q. Okay. Is it specific -- is it significant
19 that it's a tech spec versus some other
20 control?

21 A. That -- the maximum enrichment of fuel is
22 a -- is very important to a regulatory
23 requirement for any facility. That
24 affects safety issues, it affects security
25 issues as well. So you'd expect that to

2

3 be in a tech spec.

4 Q. Is it -- where is a tech spec in the
5 hierarchy of controls?6 A. It's -- it's a -- a highly important
7 document in the regulation of a nuclear
8 plant.9 Q. Okay. And you stated because control of
10 enrichment is so important for criticality
11 and security, that it would -- would
12 expect it to be in a tech spec.

13 A. Right.

14 Q. Okay.

15 You talked about during fuel
16 movement, there would be other provisions
17 for keeping the fuel assemblies away. Can
18 you explain that further?19 A. You need to make sure that you're moving
20 one assembly at a time and that all the
21 other assemblies in the building are in
22 their slots.

23 Q. Okay.

24 A. It would -- it would be creating a
25 potential for a criticality instant if you

2
3 were simultaneously making two assemblies.

4 Q. Okay, and how is that done?

5 A. Well, at Harris there's just one bridge
6 crane and one hoist on that crane; so --
7 and I'm sure the procedures encompassed
8 just the lifting and movement of one
9 assembly.

10 Q. Okay.

11 MS. CURRAN: Bill, would this be a
12 good time for a break? It's been about an
13 hour.

14 DR. HOLLAWAY: It's only been about
15 half an hour since we last had a break.

16 MR. O'NEILL: -- last had a break.

17 MS. CURRAN: Well, that was then.

18 DR. HOLLAWAY: I'm right in the
19 middle of something, so --

20 MS. CURRAN: All right, then.
21 Perhaps when you get to the next pass. Is
22 that okay?

23 DR. HOLLAWAY: Absolutely. That's a
24 good idea.

25

2
3 Q. Now, you've identified now five measures
4 for criticality control of spent fuel in
5 storages in spent fuel pools?

6 A. Yeah, of which four are -- are more a
7 matter of practical import.

8 Q. Which -- which four?

9 A. It wouldn't -- because the --

10 Q. Okay.

11 A. The spacing -- the enrichment limits were
12 set when this generation of reactors was
13 designed and licensed, and it's a generic
14 nationwide thing that really hasn't
15 changed much.

16 The spacing has changed. It's become
17 progressively smaller over the last two
18 decades.

19 The solid boron panels is new. The
20 reliance on -- well, the taking credit for
21 burn-up and enrichment limits has been a
22 new trend; and the reliance upon boron at
23 certain facilities is also a changing
24 trend.

25 Q. So when you said four of five are of

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3

practical importance, the fifth was tech
spec limits on enrichment and -- is that
right? Is that the fifth?

4

5

6

A. Yes. And just to clarify --

7

Q. Okay.

8

A. -- the -- the -- in this proceeding,

9

the -- the four are really relevant to the
Orange County's concerns.

10

11

Q. Okay.

12

Can you tell me, of the measures
you've identified, which of those measures
are physical?

13

14

15

A. Spacing, geometric configuration of the
rack is a physical provision. I wouldn't
call it a process; but a physical
provision would be the design and
construction of a rack, with a certain
spacing.

16

17

18

19

20

21

Q. Okay.

22

A. Yeah.

23

The presence of neutron-absorbing
solid panels could also be regarded as a
physical provision.

24

25

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3 The reliance upon burn-up and
4 enrichment credit is not a physical
5 provision, because although the
6 suppression of -- although the --
7 because -- let me get this straight.

8 Reliance upon burn-up and enrichment
9 credit is not a physical provision because
10 it involves administrative actions which,
11 if correctly executed, invoke a physical
12 principle. So -- so this provision
13 combines within it a set of administrative
14 requirements and actions which, if
15 executed, invoke a physical principle
16 which achieves criticality control.

17 The same can be said of boron, taking
18 credit for boron in the water.

19 Q. Okay. If these administrative actions are
20 implemented correctly, is criticality
21 control achieved?

22 A. Assuming the supporting analysis, the
23 criticality analysis, is performed
24 correctly and administrative measures are
25 performed correctly, yes.

2

3 Q. Is soluble boron put in the water a
4 physical item?

5 A. The -- the boron is a physical item. I'd
6 reiterate my previous statement that the
7 taking credit for boron in criticality
8 control is not a physical provision.

9 Q. Is the enrichment of fuel a -- a physical
10 characteristic of the fuel?

11 A. Yes.

12 Q. Is the burn-up of the fuel a physical
13 characteristic of the fuel?

14 A. Yes.

15 Q. Can you tell me which of the measures
16 you've identified are purely physical and
17 require absolutely no administrative
18 measures to implement?

19 A. None of them are purely physical.

20 For instance, take spacing. Spacing
21 achieves criticality control, provided the
22 spacing is maintained correctly. If a
23 rack were poorly designed and constructed
24 so that it were physically weak and some
25 event within the design basis, such as an

2
3 earthquake or other action compressed the
4 assemblies, then the physical provision
5 would not have achieved its desired
6 objective.

7 The distinction that I drew between,
8 on the one hand, spacing and solid panels
9 and, on the other hand, boron credit and
10 burn-up enrichment and enrichment credit
11 is that in the first category, the
12 physical provision is embodied in a -- an
13 engineering construction that has no
14 moving parts and does not rely upon the
15 action of operators or machinery or the
16 supporting services, such as electricity
17 or -- or any other supporting requirement.
18 The physical -- the physical principle is
19 embodied in a -- a construction -- a
20 construction that, once -- once
21 constructed according to specifications,
22 requires no further intervention or action
23 to achieve its function.

24 The second category - namely, boron
25 in the water or the burn-up and enrichment

2
3 credit - does require ongoing actions in
4 order to serve its required function of
5 criticality control.

6 Q. You talked about with physical separation,
7 that so long as seismic events or poor
8 construction quality did not make the
9 racks collapse, they would be okay; is
10 that correct?

11 A. Assuming analysis is correct and
12 construction is correct, yes.

13 Q. Okay. An analysis would demonstrate that
14 it would withstand, let's say, a seismic
15 event; is that correct?

16 A. Analysis can demonstrate that if performed
17 correctly.

18 Q. Okay. And construction of the racks, how
19 is that done who does that?

20 A. The racks would be typically constructed
21 by a vendor, and there would be quality
22 control provisions to verify that the
23 racks were built as specified.

24 Q. Okay; they would be constructed by people,
25 human beings?

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A. Yes.

Q. But you would verify that the racks were built to construction by inspection, by QA procedures, QA control?

A. Correct.

MS. CURRAN: Bill, I'm going to ask for that break again.

I didn't -- it wasn't really a break for me.

DR. HOLLOWAY: This would probably -- I am still in the middle, but it's probably a fine time; so go ahead.

How much time do you need? Ten minutes? Five minutes? Ten minutes?

MS. CURRAN: Yeah, that would be great.

Ten minutes?

THE WITNESS: Yeah.

MS. CURRAN: Okay, ten minutes.

DR. HOLLOWAY: Okay, sure.

(Thereupon, a break was taken at 10:45 AM, with proceedings recommencing at 10:55 AM)

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DR. HOLLAWAY: Okay, we can go back

4

on the record.

5

Q. Dr. Thompson, are you familiar with the

6

Massachusetts Institute of Technology?

7

A. Yes.

8

Q. Do you believe that someone who had been

9

granted a Ph.D. from the Massachusetts

10

Institute of Technology would be competent

11

in the field in which their Ph.D. had been

12

granted?

13

A. That's likely, but I can't be certain.

14

Q. Are you familiar with the MIT Department

15

of Nuclear Engineering?

16

A. Yes.

17

Q. Do you know anyone in that department?

18

A. I have met several people in that

19

department. I don't have any working

20

relationship with anyone there at present.

21

Q. Who are the people? Can you give me their

22

names?

23

A. People I've known in the past?

24

David Rose, who is deceased.

25

I'm sorry, the names are escaping me

2

3

now. I'm sorry, I can't recall any.

4

Q. David Rose is the one name that you recall.

5

6

A. That's -- but I have had conversations with others.

7

8

Q. But you don't recall their names; is that correct?

9

10

A. No.

11

The most recent conversation I had with someone there was by telephone a few months ago, a gentleman with an Asian name.

12

13

14

15

Q. Okay. What was the subject of the discussion?

16

17

A. That was to do with waste management. Had nothing to do with spent fuel.

18

19

Q. Okay.

20

Are you familiar with Professor Allan Henry?

21

22

A. No.

23

Q. Dr. Thompson, can you tell me how criticality control is accomplished for Harris Pools A and B?

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A. Spacing, solid boron panels. There's no reliance -- my understanding is that there's no reliance upon burn-up and enrichment credit.

The PWR racks are ten and a half-inch-spaced racks, as opposed to the nine-inch racks in Pools C and D.

I assume that there's no reliance for boron credit in normal operation.

I have not seen any accident analysis for Pools A and B regarding fuel misplacement; but given that the spacing is ten and a half inches for PWR fuel rather than nine inches, the problem of criticality control is correspondingly less demanding.

Q. Okay.

The two measures you've identified for A, B, and spacing, and the solid neutron absorber --

A. Correct.

Q. -- those two measures are physical systems?

2

3 A. I believe I said physical provisions.

4 Q. Do you consider them to be physical
5 systems and within the meaning in GDC 62,
6 General Design Criteria, and 62?7 A. I'd like to revise my final opinion on
8 that until the filing. You'll appreciate
9 that the detail of the language is going
10 to be very important and now brief.

11 Q. Okay.

12 A. But as I've stated earlier, those two
13 measures are qualitatively quite distinct
14 from boron credit and enrichment burn-up
15 credit.16 Q. While I understand that you might change
17 your mind between now and December 20th,
18 at this time do you believe that those two
19 pro- -- measures are physical systems?20 A. They are clearly closer, much closer, to
21 the requirements of GDC 62 than were on
22 credit and enrichment burn-up credit.23 Q. Okay. Okay, but you're not willing to
24 state for the record that they're physical
25 systems.

2
3 A. No, I'm -- and I'm not trying to be
4 difficult. It's just that we will take
5 great care in the language in our filing
6 and will reflect on it and are preparing
7 several drafts, so I'd rather not try to
8 prejudge that now.

9 Q. Do you have an opinion at this time on
10 that issue?

11 A. Just -- I just repeat that I've already
12 concluded that spacing and solid panels
13 are qualitatively different from the other
14 control measures and much closer to the
15 requirements laid down in GDC 62.

16 Q. Okay.

17 Assume that the criticality controls
18 for Pools C and D were changed to be the
19 same as those for A and B. Would that
20 resolve your concerns in Contention 2 in
21 this proceeding?

22 A. Consistent with what I just said about
23 reserving final judgment until our brief,
24 it's possible that that restriction would
25 resolve our concerns.

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Q. Okay.

Are you familiar with the term
"reactivity"?

A. Yes.

Q. Can you define it for me, please?

A. Reactivity is the propensity of a -- a
potentially critical system to have an
increase in neutron activity and could be
simply defined as $\frac{\Delta k}{k}$, where k
is the neutron multiplication in each
cycle, a fission from when a neutron is
born and causes another fission, and the
 Δk is the change in k that -- because
it's of interest when you're examining
reactivity.

Q. This term " k " you're referring to --

A. k is the neutron multiplication in each
cycle of fission. And $k_{\text{effective}}$ is the
neutron multiplication allowing for
leakage from a finite system, and that's
the primer that is used here to -- used to
limit burn-up under the NRC reg guide and
guidance letter and is referred to

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repeatedly in the license application.

Q. And can this k be used to determine whether a system would go critical or not?

A. You have -- have the regulatory guidance which says that k should be kept -- k effective should be kept below .95. When k effective approaches 1, then the configuration may -- is -- is prompt critical, and potentially you could have an increase in energy production from fission.

The details of that are quite complex; because once you have an increase in energy, they tend to be self- -- tend to be -- tend to be self-limiting, and we have not been able to identify any analyses of this parameter range in a spent fuel pool; namely, what happens when you are in the vicinity of prompt criticality and the extent to which the excursion would be self-limiting. That -- that you would find very interesting, and --

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Q. Okay.

A. -- it's pertinent to the risk posed by criticality in a pool.

Q. Is C equal to 1, the point at which a reaction would be self-sustaining?

A. $k_{\text{effective}}$ equals 1. It's self- --

Q. $k_{\text{effective}}$ equals 1?

A. Right, self-sustained.

Q. When you say $k_{\text{effective}}$, is there some other type of k ?

A. Another parameter that's often used is k_{infinity} , which is a critical system that has no boundaries, where leakage is not pertinent.

Q. Does that make it bigger or worse because it's so big, or what -- what's the difference between k_{infinity} and $k_{\text{effective}}$?

A. $k_{\text{effective}}$ is lower than k_{infinity} ; because in that finite system, there will always be leakage of neutrons.

Q. Okay. Is reactivity synonymous with uranium enrichment?

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A. No. Reactivity is a property of a potentially critical system. That depends upon the presence -- the nature of -- the nature and configuration of the system, the fission material, what level of enrichment, the other materials present, how they're physically configured, what moderator is present, temperature, neutron sources. All of these factors contribute to the determination of reactivity.

Q. When you say the other materials present make a difference, what other materials are you talking about?

A. Well, in the -- in the case of a -- of a rack containing spent fuel, you have the materials of the rack, then you have the materials out of which the fuel is constructed. If the fuel is -- has been burned, then you have fission products, and activation products are present, and each of these has its own effect on neutrons.

Q. So would reactivity take into account

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other isotopes in the fuel?

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A. Yes. The reactivity of a potentially
5 critical assembly is a property that's
6 determined by the atoms present and their
7 physical configuration and temperature and
8 density.

9

Q. Does burn-up affect uranium enrichment?

10

A. Increasing burn-up is correlated with
11 decreasing enrichment; because a fresh
12 fuel assembly enters a nuclear reactor
13 with zero burn-up. As the fuel is burned,
14 the uranium enrichment level falls,
15 because uranium-235 fission. So there's a
16 correlation, a negative correlation,
17 between enrichment level and burn-up.

18

Q. You say negative correlation. Would that
19 mean that as burn-up increases, uranium
20 enrichment is decreasing in the fuel?

21

A. Yes. The relationship is not uranium.

22

Q. Okay. Then is it true that burn-up
23 affects reactivity?

24

A. It does.

25

Q. Okay.

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3 DR. HOLLOWAY: I ask the court
4 reporter to mark as Exhibit 3 --

5 THE COURT REPORTER: Three.

6 DR. HOLLOWAY: -- a document that is
7 Minutes of Orange County Board of
8 Commissioners, Work Session, February 9th,
9 1999, comprising nine pages, plus the
10 accompanying presentation by Gordon
11 Thompson, appears to be thirteen pages,
12 plus agenda for the meeting.

13 (Thereupon, Thompson Exhibit No. 3
14 was marked for identification)

15 Q. Dr. Thompson, did you develop and give a
16 presentation to the Orange County Board of
17 Commissioners on February 9th, 1999?

18 A. I did.

19 Q. And do the minutes here reflect the
20 presentation you gave, accurately to the
21 extent that it discusses your statement?

22 A. I have not previously seen these minutes;
23 and given their length, I cannot comment
24 at present on their accuracy.

25 I see appended to this document

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copies of illustrations accompanying my presentation on February 9th.

Q. In particular, could you go to page 2 that are safety issues?

A. Yes (complies).

Q. There are two paragraphs there representing in the minutes your statements. Could you take time to read those.

A. Beginning line 19 on page 2?

Q. Yes, through to line 8 on page 3. Read it to yourself.

A. (Complies).

Q. Take whatever time you require.

A. Okay. I've read down to line 8 on the following page, page 3.

Q. Okay. With respect to that alone, is that an accurate reflection of your statements?

A. That matches my recollection of the -- of my presentation.

Q. Okay. Do you agree with the statements made there?

A. Since February 9th, I've acquired

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3

additional information and formed

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additional conclusions.

5

Q. Okay. Is there anything in there that's

6

no longer truthful?

7

A. Not that I'm aware of, no.

8

Q. Okay.

9

The attached presentation -- and it

10

says Illustrations Accompanying --

11

Accompanying a Presentation by Gordon

12

Thompson -- did you write this

13

presentation?

14

A. The presentation is a -- these are paper

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copies of viewgraphs that were shown at

16

the meeting.

17

Q. Okay.

18

A. And the -- the majority of the viewgraphs

19

are drawn in NRC literature or the CP&L

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license application, and some of these

21

illustrations I prepared.

22

Q. Are the materials you provided in your

23

presentation to BCOC truthful and

24

accurate, to the best of your knowledge?

25

A. Yes, with the proviso that since that

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time, I've acquired additional knowledge
and reached additional conclusions.

4

5

Q. Well, what about this presentation you
gave is no longer truthful and accurate?

6

7

A. I don't -- I don't believe there's
anything inaccurate.

8

9

I notice on page 9 there's a
reference to criticality.

10

11

Q. Okay.

12

A. And the fifth bullet on page 9 states:

13

The PWR racks in Pools C and D will not be
safe against criticality for low burn-up
or high enrichment fuel.

14

15

16

Q. Is that no longer your position?

17

A. I -- let me just think.

18

Yes, I -- I would still agree with
that statement.

19

20

Q. Okay.

21

In your presentation, you identify
dry storage as an alternative to what's
being done to activate Pools C and D.

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A. Correct.

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Q. You discuss the fact that the dry storage

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has been approved by the NRC; is that correct?

A. Correct.

Q. Is it your position that dry storage as approved by the NRC is safe?

A. There's a brief discussion of this point in a report I subsequently prepared for Orange County that is attached, I believe, to Orange County's submission of contentions in the case; and I believe I stated in that report, which I think was prepared later in February, that there are differences in the various designs approved by NRC regarding the safety and security --

Q. Okay.

A. -- that all of them are generically licensed, but that -- they're not equal in their safety and security.

Q. Okay. Just focus on criticality control. Are they safe -- are the dry storage technologies you've identified safe with respect to criticality control alone, not

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security or anything else?

A. I can't answer that directly, because I have not reviewed those designs for criticality safety.

Criticality has been considered in the granting by NRC of the generic licenses.

Q. So the NRC considered criticality control.

A. I'm certain they did.

Q. Then would it be your opinion that they would comply with the NRC's regulations on criticality control?

A. If constructed as specified, they would comply with the -- with NRC's oversight.

And this raises a question that is going to be pertinent in the Harris case, which is, what exactly is the NRC. And the NRC is the Commissioners and the body of regulations, and it's also the staff and the regulatory guides, and what the staff permits, in particular, permits particular licensees to do; and these are not -- these things are not identical, and

2
3 the differences between those different
4 elements of licensing will be an issue
5 that we'll dwell upon carefully in our
6 brief as -- as regards Harris Pools C and
7 D.

8 Having not reviewed the -- the
9 generically licensed dry storage with the
10 same set of considerations in mind, I am
11 not at the moment prepared to comment on
12 whether or not they meet the regulations
13 or NRC requirements, because those things
14 are subjects of discussion.

15 Q. Okay. Assume for the moment that the dry
16 storage casks you've identified have been
17 approved by the Commission itself, not
18 just by the staff. Would you then believe
19 that they complied with the regulations?

20 A. It's -- it is -- it is possible that one
21 or all of the generically licensed dry
22 storage technologies meets the standard of
23 regulation that we will call for in our
24 brief, and I cannot at this point say yes
25 or no to that question.

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3 Q. Okay. If the Commission itself approved
4 any of these designs, any single design --
5 assume the Commission approved a single
6 design -- would you believe that that
7 design complied with NRC's regulations?

8 When I say "the Commission," I mean
9 the Commissioners.

10 A. This -- Mr. Hollaway, you're raising here
11 a point of law, I believe, that's going to
12 be a key point of contention here. In
13 regard -- Contention 2, and the legal
14 niceties at this point would be on my
15 competence. And the regulations say what
16 they say; and the Commissioners have
17 certain powers, and the staff have powers;
18 and I -- I really don't feel able to
19 answer that question.

20 Q. Okay; the question I'm asking is, if the
21 Commission were to approve one of these
22 dry storage casks, would you then yourself
23 go back and review and determine
24 independently that they may or may not in
25 fact comply with the regulations?

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3 A. If -- if I were in the same position as I
4 am now in regard to a particular dry
5 storage technology, then I would go
6 through the same process of trying to
7 understand the differences between the
8 wording of General Design Criteria,
9 worrying about the regulations and the
10 nature of the Commissioners' decision.
11 It's conceivable that the Commissioners
12 could act inconsistent with the
13 Commission's own regulations, so that a
14 ruling by a commission does not, in my
15 mind, guarantee that the actions that are
16 ruled upon meets the Commission's
17 regulations.

18 But I repeat that this is a fine
19 point of law that really goes beyond my
20 competence.

21 Q. Okay. I'm really asking what you would
22 plan to do; and I take it, then, that you
23 would perform the same review on a spent
24 fuel storage system, regardless of whether
25 the system had been approved only by the

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2
3 staff or by the staff as well as the
4 Commissioners themselves.

5 A. If -- if called upon to do so by -- if a
6 client such as Orange County requested me
7 to assess a dry storage technology, then I
8 would go through the same process as I've
9 done here with -- with -- here with Pools
10 C and D.

11 Q. Can you turn to, in Exhibit 3, Table 1 of
12 your presentation.

13 A. (Complies).

14 Q. How about a table entitled NRC-Approved
15 Dry Spent Fuel Storage Designs?

16 A. (Examining document). I have it. Yes.

17 Q. To your knowledge, do any of these systems
18 comply with the Commissions' regulations
19 on criticality control?

20 A. I have no direct knowledge. All I know is
21 that they are generically licensed.

22 Q. What does that mean, "generically
23 licensed"?

24 A. That the -- some element of the Nuclear
25 Regulatory Commission has improved --

2
3 approved these particular designs and it
4 goes to the design -- it can be -- the
5 object can be made in a factory. It can
6 be approved on this generic basis and then
7 conveyed to a particular site, and that --
8 I understand that there is a very limited
9 licensing requirement at -- in terms of
10 site-specific requirement, provisions.

11 Q. Which casks on this list would you support
12 if CP&L were in fact to propose their use
13 for Harris as an alternative to Pools C
14 and D?

15 A. I have never been asked to rank these
16 casks.

17 I was asked by a client in New Jersey
18 to look at the Nuhoms technology, and I
19 was not satisfied with the security of --
20 of the Nuhoms design. That's the only one
21 of these cases that I've looked at in any
22 detail.

23 Q. You've looked at -- the only one you've
24 looked at is the Nuhoms design, in detail;
25 is that right?

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3 A. Right, and with the focus on the security
4 aspects of that design.

5 Q. Do you have any knowledge regarding
6 criticality control for that one that you
7 looked at?

8 A. No.

9 Q. No. You didn't look at that issue.

10 A. Correct.

11 Q. Okay. Have you proposed to BCOC the dry
12 storage as a reasonable alternative to
13 what's -- what CP&L is proposing for C and
14 D?

15 A. In general terms, yes, with the -- with a
16 major motive for this recommendation being
17 the potential for severe accident in
18 Pools C and D, and --

19 Q. Okay.

20 A. -- and that matter, of course, not being
21 the subject of the present contention.

22 Q. But you can't endorse any of these systems
23 for use as an alternative?

24 A. If requested by Orange County to do so, I
25 would offer an opinion about the

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respective merits of these technologies.

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Q. Do you have any opinion at this time
5 regarding the safety of these systems and
6 their ability to meet the NRC's
7 requirements?

8

A. No.

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Q. No. But you propose to BCOC that this --
10 these technologies with an alternative to
11 dry storage at Harris?

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A. Correct, an alternative to pool expansion
13 at Harris.

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Q. Very good. Okay.

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DR. HOLLOWAY: Ask the court reporter
to mark as Exhibit 4 a document entitled
Testimony of Gordon Thompson, in the
matter of Vermont Yankee, dated May 23rd,
1989, comprising -- appears to be
approximately twenty-nine pages.

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(Thereupon, Thompson Exhibit No. 4
was marked for identification)

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DR. HOLLOWAY: It says 28 pages on
the cover. Not relevant.

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Q. Dr. Thompson, is this your testimony from June 9th, 1989?

DR. HOLLAWAY: Just a moment. Is that correct (examining document)?

Ah.

Q. Is this your testimony from May 23rd, 1989, in the matter of Vermont Yankee?

A. This is the testimony that was submitted -- that I prepared and that was submitted, yes.

Q. You prepared this.

A. Correct.

Q. These are your answers?

A. Yes.

Q. Are they truthful?

A. To the best of my recollection at present. I haven't read them again as yet.

Q. To your knowledge, were they truthful at the time you made the statement?

A. Yes.

Q. You're not sure whether they're still true?

A. Ten years have passed, and I may have

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become better informed about some matters.

Q. Okay.

Will you turn to page 10, please.

A. (Complies). I have it.

Q. Section VII addresses alternative modes of spent fuel storage; is that correct?

A. Correct.

Q. Question states: "Are alternative, safer modes of spent fuel storage available?"

Is that correct?

A. Correct.

Q. The answer is -- at least the first clause of the answer says: "A variety of dry storage modes exist."

Continues on, last sentence says:

"Dry cask storage is not susceptible to the accident scenario described here for high-density pool storage, and it also has operational advantages."

A. Right.

Q. Is that what it states?

A. Yes.

Q. When you talk about the accident scenario

2
3 described for high-density pool storage,
4 are you speaking of an exothermic
5 zirconium oxidation reaction?

6 A. Correct.

7 Q. Okay.

8 Will you turn to page 12, please.

9 A. (Complies).

10 Q. Second paragraph states: This danger can
11 be effectively eliminated by adopting a
12 lower density of spent fuel storage in the
13 pool, while extra spent fuel is placed in
14 an on-site dry cask storage facility.

15 Is that your statement?

16 A. It is.

17 Q. This danger you're discussing, again, is
18 the exothermic zirconium oxidation
19 reaction.

20 A. Correct.

21 DR. HOLLOWAY: Ask the court reporter
22 to mark as Exhibit 5 --

23 THE COURT REPORTER: Uh-huh.

24 DR. HOLLOWAY: -- a document entitled
25 Rebuttal Testimony of Gordon Thompson, In

2
3 the Matter of Vermont Yankee, dated
4 June 9th, 1989, comprising of 13 pages.

5 (Thereupon, Thompson Exhibit No. 5
6 was marked for identification)

7 Q. Dr. Thompson, is this your testimony in
8 the matter of Vermont Yankee?

9 A. It is.

10 Q. Is this truthful?

11 A. To the best of my recollection.

12 Q. Okay.

13 On the first page, under
14 paragraph II, Benefits of Dry Cask
15 Storage, A., Severe Accident
16 Considerations, you state: "The Board
17 asked if NECNP's claim concerning the
18 environmental superiority of dry cask
19 storage rests solely on severe accident
20 considerations. The answer to that
21 question is no. While severe accident
22 risk is a primary consideration, it is not
23 the only one."

24 Is that your statement?

25 A. That's correct.

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3 Q. On page 3, under Section B., you discuss
4 other benefits of dry cask storage.

5 A. Correct.

6 Q. Is that correct?

7 A. Right.

8 Q. Is there any discussion in either
9 Exhibit 5 or Exhibit 4 of criticality
10 control or concerns with criticality
11 control with dry cask storage?

12 A. No.

13 Q. Okay. So in both Exhibits 4 and 5, you
14 were advocating the use of dry cask
15 storage as an alternative to spent fuel
16 pool storage; is that correct?

17 A. As an alternative to high-density pool
18 storage.

19 Q. And --

20 A. And of course, at that time the dry
21 storage designs were not generically
22 licensed as they are now.

23 Q. Okay. When you're proposing dry storage
24 be considered as an alternative, what
25 systems specifically were you advocating

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3 at that time?

4 A. Just bear with me a moment here (examining
5 documents).

6 Q. Sure. Take all the time you need.

7 A. At page 10 of Exhibit A -- Exhibit 4 -- I
8 apologize -- page 10 of Exhibit 4 --

9 Q. Exhibit 4? Yes.

10 A. -- I state that a variety of dry storage
11 modes exist, and the next sentence state:
12 "I focus here on the dry cask storage
13 mode."

14 Q. Okay.

15 A. And as a general matter, I then and now
16 favor cask storage such as the Castor
17 design --

18 Q. Such as the Castor, okay.

19 A. -- other than some of the other dry
20 storage storage, because it's a very
21 robust design, very secure against
22 sabotage, by comparison with designs such
23 as the Nuhoms.

24 Q. Okay.

25 A. So that's a broad statement.

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And as I mentioned earlier, I have never been asked to rank these technologies.

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7

Q. Okay, so the Castor is one that you would consider safe as an alternative?

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A. As -- as on the better end of these options.

10

11

Q. Would it be a viable alternative for an applicant to use, in your opinion?

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A. Potentially.

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Q. You say it would be a better one on the spectrum. What I'm trying to get at is, if every one on the spectrum is one that you feel is not safe and could not be licensed, then there are not any alternatives. Is that your position?

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A. My -- in this testimony of 1989, the focus was on the exothermic reaction as a source of danger.

22

Q. Uh-huh.

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A. And all of the currently licensed dry storage technologies are substantially safer than high-density pool storage,

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bearing in mind the potential for an exothermic reaction in a dense pool configuration.

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Q. Okay.

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A. Then -- that's -- that's a statement made at one level of risk.

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The risk is of a potentially large release of radioactive material to the environment, and I've argued that the same risk exists at Harris consequent upon the proposed pool expansion.

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It may be that in the licensing of a particular dry storage technology, one could have concerns at a lower level, because the potential downside, the severity of the potential accident, is greatly smaller; so concerns could exist, but not of the same qualitative magnitude.

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Q. Okay; as the zirconium oxidation reaction, that's a concern to you primarily?

23

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A. Yes, yes.

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Q. Okay.

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(Thereupon, a discussion was held off

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the record)

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Q. In fact, could you describe for me what you mean by Castor? What is that?

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A. Castor is -- capital C-A-S-T-O-R -- is a type of storage cask developed by -- in Germany which is an iron cask, thick-walled iron cask, that's used to store spent fuel.

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Q. How many assemblies would this Castor cask hold and of what type of assembly?

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A. You turn to Exhibit 3, page 12 of the attachment, states that -- on the top line, that this particular cask or model will hold 21 PWR assemblies.

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Q. Okay.

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A. There are other Castor models that have been developed.

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Q. And this -- this particular cask, you have evaluated at -- in detail with respect to the potential for zirconium oxidation reaction?

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A. No.

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3 Q. No.

4 A. At this -- the design of these casks and
5 of a -- a spent fuel pool employing such
6 casks would not permit the kind of
7 scenario that causes me concern in
8 connection with compact pool
9 configuration.

10 Q. Why?

11 A. Because the pocket of a steam-zirconium
12 reaction is precluded, assuming that water
13 is not present in the cask.

14 The analysis -- numerous analyses
15 have been performed of temperatures of
16 fuel in these casks, showing them to be
17 below the ignition point of zirconium; and
18 in the event that zirconium reaction for
19 some reason occurred in one of these
20 casks, the quantity of radioactivity would
21 at least be limited to that -- all the
22 assemblies in the pool.

23 Q. These are dry storage designs; is that
24 correct?

25 A. Correct, yes.

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3 Q. Is there ever water in one of these Castor
4 casks?

5 A. When they are filled, if they're --

6 Q. Explain further.

7 A. When you extract spent fuel from a nuclear
8 plant and place it in a cask, you do so
9 under water; and the cask then has to be
10 emptied and dried out and filled with a
11 gas that's going to be used as the fueling
12 medium thereafter.

13 Q. Okay, so there would be water in the cask
14 at the time the spent fuel is loaded into
15 it.

16 A. That's correct, yes.

17 Q. Would there -- you said there was no water
18 for a steam-zirconium reaction. I gather
19 that wouldn't be true while the cask was
20 being loaded.

21 A. That's correct, yes.

22 Q. Okay, but it would still be okay from a
23 steam -- I mean, there would be water,
24 but --

25 A. Yes. The -- I believe I said assuming the

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water is removed correctly.

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Q. Okay.

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A. Furthermore, assuming that this were not done correctly and a cask were placed in a storage position filled with or partially filled with water --

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Q. Uh-huh.

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A. -- then no further action were taken, the cask were simply left standing there, then a -- the presence of water could cause a corrosion problem in the fuel, but would not initiate -- the clouding would not reach the temperatures where either the steam is occurring or if occurring, would go --

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Q. Okay. So at least this Castor would address your concern with the zirconium reaction; and that's why you consider it, of these, the best, even if --

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A. No. The -- comparing the Castor to Nuhoms --

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Q. Yes.

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A. -- for example, my preference for the

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3 Castor is -- its security against
4 sabotage.

5 Q. Because it has a different wall?

6 A. A thicker wall, essentially.

7 Q. Okay.

8 A. Nuhoms has a very thin wall surrounded by
9 a concrete structure within which there
10 are orifices that, under certain
11 scenarios, could permit access of -- by a
12 saboteur to the thin-walled primary
13 container.

14 Q. Other than sabotage, are they -- they're
15 the same from the zirconium oxidation
16 standpoint, it's at sabotage that
17 differentiates them on your list?

18 A. That's the main factor that I've
19 identified.

20 But I repeat an earlier statement,
21 that I've never been asked to review and
22 rank all of these designs.

23 Q. Okay; but from a steam-zirconium thing,
24 they should be the same, the ones on this
25 list?

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3 A. Generally speaking, yes.

4 Q. Okay.

5 DR. HOLLOWAY: I ask the court
6 reporter to mark as Exhibit 6 a
7 Declaration of Dr. Gordon Thompson, In the
8 Matter of Carolina Power & Light, dated
9 February 12th, 1999, consisting of
10 twenty-two pages, maybe thirty-two, I'm
11 not sure. Twenty to thirty pages,
12 approximately.

13 (Thereupon, Thompson' Exhibit No. 6
14 was marked for identification)

15 Q. Dr. Thompson, did you write this?

16 A. I did.

17 Q. And is it still truthful?

18 A. To the best of my knowledge.

19 Q. Well, I -- I guess the predicate is was it
20 truthful at the time you signed it.

21 A. Yes.

22 Q. Okay; and it's still truthful, okay, to
23 the best of your knowledge.

24 I just want to clarify something.
25 Look down here (examining document). On

2
3 page 8, paragraphs 29 and 30 discuss
4 cesium-137, potential release to the
5 environment, to the significant fraction,
6 of cesium-137; is that correct?

7 A. It does, yes.

8 Q. Is it correct that this refers to the
9 steam-zirconium or zirconium oxidation
10 reaction you're discussing? Is that what,
11 this scenario, this is for?

12 A. Yes.

13 Q. On page 10, paragraph 39, paragraph states
14 that: A variety of events, alone or in
15 combination, could lead to partial or
16 complete uncovering of spent fuel in the
17 Harris pools. Is that correct?

18 A. Yes.

19 Q. And it lists on the third sentence
20 relevant events, identifies them.

21 Is it correct that none of these
22 include criticality control?

23 A. That's correct.

24 Q. Okay. Oh; and again, on page 12,
25 paragraph 47 discusses severe accidents,

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magnitude of exposure. Again, I understand this to be for the zirconium oxidation reaction. Is that correct?

A. Correct.

Q. And not for criticality control.

A. Correct.

Q. Okay.

DR. HOLLOWAY: Ask the court reporter to mark as --

THE COURT REPORTER: Seven.

DR. HOLLOWAY: Seven?

THE COURT REPORTER: Yep.

DR. HOLLOWAY: -- 7 document entitled Lacey Township Board of Adjustment, in regard to the matter of Jersey Central Power and Light, approximately thirty pages.

(Thereupon, Thompson Exhibit No. 7 was marked for identification)

DR. HOLLOWAY: It's dated June 5th, 1995.

Q. Dr. Thompson, do you recognize this document?

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A. No, I've never seen this before.

Q. Okay.

A. I did appear on that occasion, and I didn't -- I did not present written testimony. I shared viewgraphs and distributed paper copies of the viewgraphs and was quizzed by the Board, and was previously unaware that there was a transcript.

Q. It's a nice little benefit for you, then.

This is a presentation; and there are numerous places that state "Dr. Thompson," followed by statements. Do you understand those to be statements of you, Dr. Gordon Thompson?

A. I -- I assume they were, yes.

Q. Do you have any reason to believe these were a different Dr. Thompson than you?

A. I have no such reason.

Q. Okay. What was your role in this particular Jersey Central Power and Light proceeding in the 1995 time frame?

A. This related to the Oyster Creek Nuclear

2
3 Plant, and there was an application for an
4 on-site spent fuel storage facility using
5 the Nuhoms technology.

6 Q. Was that a dry storage facility?

7 A. Yes.

8 Q. Dry storage technology would be used
9 there.

10 A. Yes.

11 And I was asked to -- asked by an
12 environmental group and a town -- I don't
13 recall the name of either one at
14 present -- to appear; and I -- my
15 presentation covered potential for reactor
16 accidents, high-density pool accidents,
17 and accidents or other problems with the
18 proposed Nuhoms dry store.

19 Q. In this proceeding and in the Vermont
20 Yankee proceeding we've talked about,
21 you've advocated dry storage as an
22 alternative to the high-density spent fuel
23 pool storage. In this proceeding, is it
24 not correct that you opposed dry storage
25 as an alternative to spent fuel storage in

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the pools?

A. No, that's not correct. The -- as I mentioned, my testimony discussed reactor accidents, high-density pool accidents, and potential problems with dry storage. I believe I made it clear that the magnitude of the release of long-lived radioactivity would be by far the greatest with a pool accident and that both a pool accident and a reactor accident would be more severe than an accident or incident with dry storage.

And in terms of incidents with dry storage, I believe most of my discussion pertained to its susceptibility to sabotage --

Q. Okay.

A. -- which is a point that I've addressed earlier here.

Q. You opposed the use of the Nuhoms system for dry storage at Oyster Creek; is that correct?

A. No. I did not either favor or disfavor

2
3 any action here.

4 My firm recollection is that I was
5 characterizing available options and their
6 properties and their risks and that I
7 called for a systematic assessment of the
8 options and their characteristics and
9 risks.

10 And I do know that one of my
11 illustrations summing up my presentation
12 called for a broad assessment of
13 options --

14 Q. What was that -- oh, continue.

15 A. -- and I don't have with me the -- the
16 presentation; but on that occasion, as
17 I've done elsewhere, I -- I really stress
18 the importance, before making a decision,
19 that a public body such as a zoning board
20 should be fully aware of the options and
21 their implications.

22 The parties that had requested me to
23 attend may not have had the same agenda.
24 And I believe that the environmental group
25 which was one of my two sponsors was

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formally opposing the dry store, but that -- that was not a position that I took myself.

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Q. So is it correct, then, that your assessment of the Nuhoms technology was neutral, you neither favored nor disfavored it?

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A. I -- I summed up my statement by calling for a broad assessment of all of the available options.

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It's very likely that I laid particular stress on the potential for pool accident, because that's been a preoccupation of mine for many years; so I -- it's very likely that that was the -- the dominant theme of my presentation.

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23

And I do clearly recall being dissatisfied with the design of the Nuhoms design in regard to sabotage; so I imagine that was the subject of considerable discussion, also.

24

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Q. Okay. When you talk about potential for a pool accident, you're not talking about

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the dry storage cask, you're talking about the pool itself?

A. Right.

Q. Okay.

MS. CURRAN: Bill?

DR. HOLLAWAY: Yes?

MS. CURRAN: It's five after twelve.

DR. HOLLAWAY: Okay.

MS. CURRAN: So sometime soon, can we break for lunch?

DR. HOLLAWAY: That's a great idea.

MS. CURRAN: Okay. I'm drowning out the court reporter with the growling of my stomach.

Q. Could you turn to what's 129. There's four pages to a sheet, but the page has 129 on it.

A. Sure (complies).

Q. On the bottom of page 129, it says "Dr. Thompson," and then a statement: "There will be neutron-absorbing tubes, and there will be -- the water will be removed. So assuming that both of those

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are done correctly, then the fuel should be well away from criticality."

A. I hope I was more lucid at the time than is reflected here.

Q. Is this your statement?

A. I assume so, but I think I may have been a little more lucid.

Q. Okay. Besides the lucidity, are the concepts here consistent with your belief?

A. The -- the Nuhoms canister has to be critical-safe with water present in order for it to be filled.

Q. Okay.

A. So if I was implying at the time that the presence or absence of water was relevant to criticality, then I was mistaken.

Q. Okay, but the -- at least it looks to me that you addressed the issue of criticality for this cask and said it was okay. Is that correct?

A. Yes, assuming that -- as I -- assuming that it was designed correctly.

Q. Designed or constructed correctly?

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Because this --

A. What I say is assuming that both of these are done correctly.

Q. Okay.

A. And when I say both, I was clearly -- if I did indeed say this, I was clearly mistaken in referring to water; because as I think about it now, you must be critical-safe with water present.

Q. This is referring to the Nuhoms cask.

A. Right.

Q. When you say assuming both of these are done correctly, my understanding is you're talking about the construction of it.

A. The construction --

Q. Okay.

A. -- of the -- not the storage module.

Q. Okay.

Could you turn to page 99.

A. (Complies). I have it.

Q. At the bottom of page 99, carrying on to page 100, you state: "However, as I pointed out in the parenthesis under that

2
3 bullet, the proposed dry storage system is
4 not suitable for this fuel without
5 redesign. According to the materials that
6 I have, the Nuhoms system reaches its
7 heat -- its cooling limit at about five
8 years after discharge. And therefore, a
9 system, to take newly discharged fuel,
10 would have to be of a different design."

11 A. Right. And that matches my recollection
12 of the Nuhoms design parameters.

13 But each -- each of the licensed dry
14 storage technologies will have a limit on
15 the discharge time for which the
16 technology can be used.

17 Q. Okay.

18 A. And evidently, this -- this -- I'm
19 responding to a questioner who's asking
20 about offloading recently discharged fuel.

21 Q. Okay.

22 A. But I ...

23 Can I just read the prior -- prior
24 discussion?

25 Q. Go right ahead. Sure.

2
3 A. (Examining document).

4 Yes; okay. What this is about is
5 that the -- with the high- -- with
6 high-density pool storage, the potential
7 for an exothermic reaction in the event of
8 water loss is greatest when the fuel is
9 recently discharged; and after some period
10 of delay after discharge, the exothermic
11 reaction will not be -- initiate in the
12 event of water loss. That age is poorly
13 characterized.

14 I take issue with the analysis that's
15 been used by Brookhaven and Tandy and
16 others on this point.

17 So there is an age of fuel after
18 discharge, that might be five years or
19 might be ten years, after which the
20 exothermic reaction will not be initiated
21 in the event of water loss. Therefore, if
22 one has a pool with high-density racks in
23 it, which I believe was the case at Oyster
24 Creek when I made this statement, then an
25 option for avoiding the exothermic

2
3 reaction risk is to remove from the pool
4 the recently discharged fuel.

5 And I was pointing out that that
6 option does not exist with the Nuhoms
7 design, because that design cannot receive
8 fuel unless it is aged at least five
9 years.

10 Q. Okay. So if a cask cannot take fuel until
11 it's been out at least five years, like
12 Nuhoms, it's not going to address your
13 zirconium oxidation concern.

14 A. The point here was that the pool was
15 already at high density.

16 Q. Yeah.

17 A. So the --

18 And another option which I may or may
19 not have addressed would have been to
20 offload old fuel into the Nuhoms casks and
21 then re-rack the pool at low density. And
22 I don't recall if that was addressed or
23 not, but that would be another way of
24 dealing with the problem.

25 Q. Uh-huh. As an alternative to the use of

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high-density spent fuel storage racks,
4 this Nuhoms cask that can only take fuel
5 five years or older is not an acceptable
6 alternative?

7

A. In this particular instance where the pool
8 had already been re-racked at high
9 density.

10

Q. Where the alternative was high-density
11 spent fuel storage racks.

12

A. Pre- -- preexisting high-density racks.

13

Q. How would it be different if the
14 high-density racks were being built and
15 licensed by Harris?

16

A. Then the alternative -- the alternative
17 would be to use low-density racks instead
18 of high-density and dry storage for the
19 older fuel.

20

Q. Did they have any fuel older than five
21 years at Oyster Creek?

22

A. They did, yes.

23

Q. Then why did you make this statement that
24 if it couldn't take newly discharged fuel,
25 it would have to be of a different design?

2
3 A. Because offloading the old fuel from the
4 Oyster Creek pool would not have helped,
5 because the recently discharged fuel would
6 have still have been at high density and
7 therefore could have suffered an
8 exothermic reaction in the event of water
9 loss.

10 Q. Therefore, if a cask could not take newly
11 discharged fuel, it would not be able to
12 address your -- and high-density racks
13 were in use, it would not be able to
14 address your concern.

15 A. That's correct, in this particular
16 combination of circumstances.

17 Q. Okay.

18 If you could refer back to -- let's
19 see where it is here (examining document).

20 Ah -- refer back to your -- Exhibit No. --

21 MR. O'NEILL: Three.

22 DR. HOLLAWAY: Three?

23 MR. O'NEILL: That's minutes
24 (indicating).

25 DR. HOLLAWAY: List of approved --

2
3 NRC-approved dry spent fuel storage
4 designs.

5 Q. Tell me, Dr. Thompson, which of the
6 technologies you have listed on this page
7 can take fuel newly discharged from the
8 reactor. Just -- just I'll check them off
9 as you name them.

10 A. I -- I don't recall the specifications on
11 any of these, but I would assume that none
12 of them will take recently -- immediately
13 discharged fuel.

14 DR. HOLLOWAY: Okay. Now would be a
15 fine time to take a break --

16 MS. CURRAN: Great.

17 DR. HOLLOWAY: -- because I'm going
18 to switch gears.

19 MS. CURRAN: Okay.

20 (Thereupon, a discussion was held off
21 the record, after which lunch break
22 was taken at 12:17 PM, with
23 proceedings to be recommenced in one
24 hour. Proceedings were recommenced
25 at 1:24 PM)

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DR. HOLLAWAY: Back on the record.

Q. Dr. Thompson, have you ever written any regulations for fission reactor criticality control?

A. No.

Q. Have you ever written any regulatory guides for fission reactor criticality control?

A. No.

Q. Have you ever written any regulations or regulatory guides for any fission reactor issues?

A. No.

Q. Have you ever implemented NRC regulations at a nuclear power plant?

A. No.

Q. Have you ever implemented reg guides at a nuclear power plant?

A. No.

Q. Have you ever worked as a licensing engineer for a nuclear power plant?

A. No.

Q. You are not an attorney, are you?

2

3 A. Correct.

4 Q. And you have not been an attorney.

5 A. Correct.

6 Q. You are a physicist, as I understand it.

7 Is that correct?

8 A. Well, my resumé says that I'm a consulting
9 technical and policy analyst.

10 Q. Very good.

11 Are you an expert in criticality
12 control regulation?

13 A. I will have sufficient expertise to
14 support the part of the brief on this
15 contention.

16 Q. What is your answer to my question?

17 A. That question can't be given an accurate
18 yes or no answer.

19 Q. Why is that?

20 A. Because the word "expert" is open to
21 interpretation. When you say are you
22 expert in a certain activity, that
23 question is not a straightforward yes or
24 no question, it's open to interpretation.

25 Q. By who?

2

3 A. I interpret that question as not being
4 susceptible to a yes or no answer.

5 Q. Do you put yourself forth as an expert in
6 criticality control regulation?

7 A. Sufficient to support a brief, our brief,
8 yes.

9 Q. I take it that's some aspect of
10 criticality control regulation?

11 A. Yes, yes.

12 Q. What aspect would you hold yourself forth
13 as an expert in criticality control
14 regulation?

15 A. The -- in interpreting the -- the language
16 of GDC 62 and analyzing the various
17 interpretations of that which have been
18 made over the years by the NRC staff.

19 Q. And what do you assert makes you competent
20 to interpret GDC 62?

21 A. General knowledge of the nuclear industry
22 and nuclear safety and physical principles
23 of nuclear safety.

24 Q. Okay.

25 Dr. Thompson, what's your role in

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developing Contention 2 in this proceeding?

A. I worked with Attorney Curran on articulating the contention as presented. We went through a number of discussions of it.

Q. Did you write the contention?

A. I think I first identified this as a potential issue, and then we had numerous discussions in developing the language in the contention and the basis language.

Q. So there was back and forth between yourself and Miss Curran on the language of the contention.

A. A lot of it verbal.

Q. Okay.

Does Contention 2 as proposed by BCOC represent your position?

A. It certainly did at the time. And if I were to rewrite it, if I were to write it now or review it now, I might want to change some things.

Q. Okay. We can talk about in a minute what

2
3 you might change.

4 Are you aware of anyone else working
5 on Contention 2 for BCOC?

6 A. "Working on" I assume covers Attorney
7 Curran and myself. No one else.

8 Q. No one else, okay.

9 A. I should say that as you know, David
10 Lochbaum is associated with BCOC in this
11 proceeding; and I have discussed
12 Contention 2 with Mr. Lochbaum in a
13 general sense, just professional
14 exchanges.

15 Q. Have you discussed any proprietary or
16 confidential information with
17 Mr. Lochbaum?

18 A. No, because he's not -- he has not signed
19 an agreement for that material.

20 DR. HOLLOWAY: Ask the court
21 reporter -- court reporter to mark as
22 Exhibit 8 --

23 MR. O'NEILL: Eight.

24 DR. HOLLOWAY: -- Declaration of
25 Dr. Gordon Thompson, In the Matter of

2
3 Carolina Power & Light, dated April 5th,
4 1999, consisting of two pages.

5 (Thereupon, Thompson Exhibit No. 8
6 was marked for identification)

7 Q. Is that your signature on page 2,
8 Dr. Thompson?

9 A. Yes.

10 Q. And are the statements in here truthful,
11 to the best of your knowledge?

12 A. Yes.

13 DR. HOLLAWAY: Ask the court reporter
14 to mark as Exhibit 9 Orange County's
15 Supplemental Petition to Intervene, dated
16 April 5th, 1999.

17 (Thereupon, Thompson Exhibit No. 9
18 was marked for identification)

19 Q. Dr. Thompson, do you recognize this
20 document?

21 A. I do.

22 Q. And did you participate in the development
23 of this document?

24 A. I did.

25 Q. Are these the proposed contentions by BCOC

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in this proceeding?

A. They are.

Q. Yes.

DR. HOLLAWAY: For the record, this ends with Contention 3 and doesn't deal with the other contentions, because I didn't want to waste any more paper than necessary.

MS. CURRAN: It stops at the very first page of Contention 3, right? I have up to page 13.

DR. HOLLAWAY: Yes, yes. It goes all the way up to Contention 3. I couldn't see any reason --

MS. CURRAN: Okay, okay.

(Thereupon, a discussion was held off the record)

Q. Could you turn to page 12, Dr. Thompson.

A. (Complies). I have it.

Q. Very good.

The last paragraph states -- first sentence states: "In any event, Draft Reg. Guide 1.13 does not support the

2
3 administrative measures proposed by CP&L."

4 It continues: "Other parts of the
5 Draft Reg. Guide clearly proscribe such
6 activity."

7 References on the last line
8 page 1.13-9 of the Draft Reg. Guide.

9 At the top of page 13, it quotes from
10 that page, 1.13-9, as follows: "At all
11 locations in the LWR spent fuel storage
12 facility where spent fuel is handled or
13 stored, the nuclear criticality safety
14 analysis should demonstrate that
15 criticality could not occur without at
16 least two unlikely, independent, and
17 concurring failures or operating limit
18 violations."

19 Is that a direct statement of the
20 section from the proposed contention?

21 A. It looks familiar, looks correct to me.

22 Q. I just read it. Did you understand what I
23 read to be what's written here?

24 A. I -- yes.

25 Q. Okay.

2
3 A. But it matches my recollection of what the
4 reg guides is.

5 Q. Oh, okay. Very good.

6 Continues: "CP&L's proposed
7 administrative controls on criticality
8 would not satisfy this requirement --
9 requirement because only one failure or
10 violation - namely, placement in the racks
11 of PWR fuel not within the, quote,
12 acceptable range of burn-up - could cause
13 criticality."

14 In the next paragraph, the second
15 sentence states: "The language at page
16 1.13-9 is consistent with GDC 62."

17 It continues on.

18 Is this an accurate reading of what's
19 here?

20 A. Yes.

21 Q. Is it true as you've stated, the language
22 at page 1.13-9 is consistent with GDC 62?
23 Is that still your position?

24 A. I don't -- where does it say that it's
25 consistent with -- can you tell me that?

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3 Q. Page 13, last paragraph before getting to
4 Contention 3. Second sentence starts with
5 the clause, "Because the language at page
6 1.13-9 is consistent with GDC 62."

7 A. Sure.

8 THE COURT REPORTER: Excuse me.

9 What was the answer?

10 DR. HOLLAWAY: I think he said

11 "sure."

12 Q. But you're still thinking?

13 A. No, I'm thinking.

14 Q. Is this what it states? Is that what it
15 is?

16 A. That's what it states.

17 Q. Okay; very good.

18 And the previous paragraph, the
19 section I read, the assertion made is that
20 CP&L's proposed administrative controls
21 would not satisfy this requirement that
22 you've established because one failure -
23 namely, placement in the racks of PWR fuel
24 not within the acceptable range - could
25 cause criticality.

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Do you have any analysis to back up that statement?

A. No.

Q. Okay. And is that -- that is the statement in your contention, correct? It does say that.

A. Right.

Q. It states one failure or violation. Is that correct?

A. That's what it says.

Q. Okay. Does it state anywhere in here any concern regarding fixed neutron poisons or geometry separating spent fuel racks?

A. No.

Q. So I take it, then, the contention does not address, because it does not discuss, neutron poisons in the spent fuel racks or separation of the fuel. This part of the contention (indicating).

A. I -- it doesn't follow that the absence of some discussion implies that the unmentioned issue is not of concern.

Q. It -- it may be of concern to you. Are

2
3 you familiar with the fact that
4 contentions are defined by their literal
5 terms? Is that -- actually -- yes?

6 A. I -- I'll take your word for it.

7 Q. This goes back to your earlier statement
8 that if you were to write this now, you
9 might have written it differently. Are
10 there things you would have added if you
11 could have -- you know, now that you could
12 change it or add things, are there other
13 things that you would add?

14 A. I think we'd have a more careful and
15 thorough discussion of administrative
16 measures and the role of administrative
17 measures in association with physical
18 provisions for criticality.

19 Q. Okay.

20 A. I think we -- we would do a much better
21 job now of articulating these issues.

22 Q. You told me the language at page 1.13-9
23 that you've stated is consistent with GDC
24 62. Is this what is known as the Double
25 Contingency Principle?

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A. The Double Contingency Principle has been, in my reading of this literature, interpreted in different ways. The language here is that criticality could not occur without at least two unlikely, independent, and concurring failures. I've seen the term "Double Contingency Principle" used with a different interpretation; namely, that it is not necessary to consider two failures; and that's a different statement than the one shown on this page. This statement requires the proponent to demonstrate the criticality could not occur without, as it says, at least two --

Q. Okay.

A. -- unlikely, independent, and concurring failures.

Q. Okay.

A. All of these words have meaning that we expect to be analyzing in some detail in our brief.

Q. Do you take that to be any different than

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saying the -- there is not a requirement to analyze two unlikely, independent, and concurring failures taken together? Is that not the same statement?

A. "At least" is also --

Q. Okay.

A. -- pertinent; and to properly address the phrase "at least," there, I would argue, should be an examination of other possible combinations involving potentially three failures or violations.

Q. So rather than saying "at least two," would it be the same to say "two or more"?

A. Yes.

Q. So the applicant -- would you take the position that applicants would have to analyze two or more, up to any possible number of unlikely, independent, and concurring failures taken together? Is that what this requires?

A. The "or more" could, obviously, be taken to extreme; and at some point, someone has to exercise judgment.

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Q. What do you believe that "unlikely" means?

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A. That can be and is interpreted very differently in nuclear safety regulation, and there's no -- there's no objective determination of that.

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Q. Is it your position that the regulations require a PRA or PSA of criticality control on spent fuel pools?

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3 A. The -- this -- there's -- there's a matter
4 of law on that, which I'm not competent to
5 speak about, what the regulations may or
6 may not require.

7 Looking at this problem from a -- the
8 point of view of a safety analyst, I see a
9 steady progression over the years of
10 reducing and eliminating margins of safety
11 on criticality; and my interpretation of
12 GDC 62 is that these -- this progressive
13 whittling away of margins has gone to the
14 point where it's -- it's diverged
15 considerably from the intent that the
16 frames had, the GDC 62. And then you say,
17 as a safety analyst, Well, does this
18 matter; and that's -- that's where
19 consequence analysis gives you some
20 guidance. The bigger the consequence the
21 more serious that you take the event.

22 Again, I speak as my view as an
23 analyst, not -- not as a matter of law.

24 And there has been, as far as I can
25 determine, no analysis of either

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3 A. The -- this -- there's -- there's a matter
4 of law on that, which I'm not competent to
5 speak about, what the regulations may or
6 may not require.

7 Looking at this problem from a -- the
8 point of view of a safety analyst, I see a
9 steady progression over the years of
10 reducing and eliminating margins of safety
11 on criticality; and my interpretation of
12 GDC 62 is that these -- this progressive
13 whittling away of margins has gone to the
14 point where it's -- it's diverged
15 considerably from the intent that the
16 frames had, the GDC 62. And then you say,
17 as a safety analyst, Well, does this
18 matter; and that's -- that's where
19 consequence analysis gives you some
20 guidance. The bigger the consequence the
21 more serious that you take the event.

22 Again, I speak as my view as an
23 analyst, not -- not as a matter of law.

24 And there has been, as far as I can
25 determine, no analysis of either

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3 probability or consequences of pool
4 criticality events; so there is no basis
5 for making a determination as to what
6 level of likelihood would be acceptable in
7 interpreting this wording.

8 Q. Would a PSA tell you what is likely or
9 unlikely?

10 A. There's a very big margin of error on
11 likelihood as done by PRA or PSA. You
12 could determine consequences with a much
13 narrower margin of error; and the
14 criticality consequence analysis is, I
15 think, a feasible and not -- not hugely
16 expensive exercise.

17 Q. You have no position on what "likely"
18 means in this context?

19 A. Not at present.

20 Q. Is likely the same as credible, in your
21 view?

22 A. No. Credibility implies a cutoff. On one
23 side is correct, on one side there's
24 incorrect. Likelihood is a spectrum that
25 doesn't have a cutoff.

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3 Q. Okay.

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A. At a minimum, yes.

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Q. Do you maintain that applicants must analyze criticality occurring with two or more, or at least two, such events?

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A. At least -- at least two. And the more than two is simply to bound -- to give some sense of the spectrum of likelihood.

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Q. In the event that such an analysis was done with two, three, four unlikely, independent events and criticality was shown to occur for these things, which is allowed here, what would you do -- what would you recommend be done with such information?

23

24

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A. I would prefer a regulatory guide that -- and this is a -- a draft for comment -- I would prefer one that is more precise

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3

about what it recommends be allowed and
4 what should not be allowed. And I think I
5 would come down on the side of prohibiting
6 burn-up credit --

7

Q. Okay.

8

A. -- as an explicit statement in the reg
9 guide.

10

DR. HOLLAWAY: Ask the court reporter
11 to mark as Exhibit --

12

MR. O'NEILL: Ten.

13

DR. HOLLAWAY: -- 10 --

14

THE COURT REPORTER: Yes.

15

16

DR. HOLLAWAY: -- an April 14th,
17 1978, letter from Brian K. Grimes of the
18 NRC to All Power Reactor Licensees.

17

18

(Thereupon, Thompson Exhibit No. 10
19 was marked for identification)

19

20

Q. Could you turn to page Roman III-1,
21 please, Dr. Thompson.

21

22

A. (Complies).

23

Q. First of all, have you seen this document
24 before --

24

25

A. I have.

2
3 Q. -- Dr. Thompson?

4 On Roman III-1, under Section 1.2,
5 Postulated Accidents, it states: "The
6 Double Contingency Principle of ANSI
7 N 16.1-1975 shall be applied. It shall
8 require two unlikely, independent,
9 concurrent events to produce a criticality
10 accident."

11 Does that help clarify for you the
12 definition of the Double Contingency
13 Principle?

14 A. I have not yet reviewed this ANSI
15 document.

16 The phrase "Double Contingency
17 Principle" is invoked elsewhere by saying
18 that only one failure need be considered.
19 I would have to dig through my
20 documentation to find out, but it's in
21 material that I -- I possess.

22 Q. So you're aware of a definition using
23 different terms in -- the phrase "Double
24 Contingency Principle" being used with a
25 different statement than the one that

2
3 appears here. Do you maintain that it's a
4 material difference in the analysis
5 required?

6 A. Yes.

7 Q. And what's that difference?

8 A. In that the -- first of all, this
9 statement in this April '78 document is
10 different in that it is absent the words
11 "at least."

12 Other interpretations that have been
13 invoked for the Double Contingency
14 Principle make a further modification in
15 that they say that only one failure need
16 be considered; and that's -- that does not
17 address these words "unlikely,
18 independent, and concurrent."

19 Now --

20 Q. When you say it doesn't address, you mean
21 it does not address further, or aren't
22 they stated?

23 A. It's -- no. The -- the interpretation
24 that only one failure is required simply
25 sidesteps any discussion of whether these

2
3 events are both -- these two or more
4 events are unlikely, independent, and
5 concurrent.

6 For example, if you assume that --
7 let's -- let's say you assume that CP&L
8 has done -- in its response to the NRC's
9 RAI, that accident analysis requires the
10 consideration of a worst case involving
11 misplacement of one fresh fuel assembly.
12 That's an interpretation that CP&L has
13 made of postulated accidents. One fresh
14 assembly placed adjacent to other fuel
15 assemblies at the outer -- at the extreme
16 margin of the permissible range of burn-up
17 enrichment as in the proposed tech specs
18 for -- in C and D. That's -- that's an
19 interpretation of the Double Contingency
20 Principle that I regard as insufficient;
21 and I do not believe that it meets the
22 language of at least two unlikely,
23 independent, and concurrent events.

24 Q. Okay.

25 DR. HOLLOWAY: Ask the court

2
3 reporter to mark as Exhibit 11 transcript
4 from prehearing conference, Carolina
5 Power & Light Company, dated May 13th,
6 1999.

7 Similar to the previous thing I put
8 in, this -- this goes all the way up to
9 Contention 2 and Contention 3, but doesn't
10 add the afternoon session.

11 (Thereupon, Thompson Exhibit No. 11
12 was marked for identification)

13 Q. Dr. Thompson, are you familiar with this
14 document?

15 A. Yes.

16 Q. Were you at this prehearing conference?

17 A. I was.

18 Q. Could you turn to page 93, please.

19 A. (Complies).

20 Q. In the second paragraph, it's stated that
21 it appears to be that if a low burn-up
22 assembly is mistakenly placed in the
23 pool ...

24 Continue the next sentence.

25 ... there could be a human error in

2
3 which insufficient boron was introduced,
4 and thereby that would make a second error
5 contributing to a criticality accident.

6 Is that an accurate reflection of
7 what's stated here?

8 A. Yes.

9 Q. I take it that that says misplacement of a
10 low burn-up assembly is a separate second
11 error from insufficient boron in the pool.
12 Is that correct?

13 A. That's what it says.

14 Q. Okay. Do you agree with that, with that
15 statement of your counsel?

16 A. A misplacement of a single assembly and an
17 insufficiency of boron would be two
18 separate errors. That does not
19 necessarily exhaust the universe of
20 possible unlikely, independent, concurring
21 failures.

22 DR. HOLLOWAY: Ask the court reporter
23 to mark as Exhibit 12 a memorandum and
24 order from the Atomic Safety and Licensing
25 Board, in the matter of Carolina Power &

2
3 Light Company, numbered LBP-99-25, dated
4 July 12th, 1999.

5 (Thereupon, Thompson Exhibit No. 12
6 was marked for identification)

7 DR. HOLLOWAY: This will be as the
8 others. It will end after it gets to
9 Contention 3.

10 Q. Can you turn to page 19, please.

11 A. Yes (complies).

12 Q. On page 19 is written Basis 2 of this
13 contention. Is it your understanding that
14 that is what we have been discussing to
15 this point in your proposed contentions,
16 that it was Basis 2 that we were
17 discussing?

18 A. We're entering here on some matters of law
19 where my competence is limited. However,
20 I'll venture a couple statements.

21 Orange County submitted a contention
22 on a basis, and CP&L reinterpreted that
23 basis, using its words different from
24 those used by Orange County; and I believe
25 the Board is here using words that

2
3 originated with CP&L.

4 If you are asking me what I agree or
5 disagree with, I think that's touching on
6 matters of law beyond my competence.

7 Q. My question is much simpler. I just want
8 to make sure we're both on the same page,
9 that what we've been discussing thus far
10 is the same concept that's in Basis 2, not
11 all the same issues.

12 MS. CURRAN: Request for
13 clarification. "Thus far," you mean
14 throughout this deposition?

15 DR. HOLLOWAY: No. I mean when I was
16 discussing from the contentions as
17 proposed, which don't start out Basis 2
18 and then go forth. I just want to make
19 sure that we're on the same page on this.

20 THE WITNESS: "On the ..." -- "on the
21 same page." I don't understand.

22 DR. HOLLOWAY: Don't -- don't worry
23 about it.

24 Q. On page 19, under b., does it state
25 Basis 2?

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A. It does.

Q. Okay. Who wrote this document?

A. This document originates with the Board,
the licensing board.

Q. Which board?

A. The Atomic Safety and Licensing Board
presiding over this proceeding, this
license proceeding.

Q. Okay.

Turn to page 18, please.

A. (Complies).

Q. You see where it says Ruling,
Dr. Thompson?

A. Yes.

Q. It states there: "In discussing this
contention, we utilize CP&L's two-basis
construct, which we again find both useful
and accurate.

Is that what it states?

A. That's what it states.

Q. Back to page 19.

A. (Examining document).

Q. Basis 2 as stated here as: "The use of

2
3 credit for burn-up is proscribed because
4 Regulatory Guide 1.13 requires that
5 criticality not occur without two
6 independent failures; and one failure,
7 misplacement of a fuel assembly, could
8 cause criticality if credit for burn-up is
9 used."

10 Continues: "The second basis raises
11 a question of fact. Will a single fuel
12 assembly misplacement involving a fuel
13 element of the wrong burn-up or enrichment
14 cause criticality in the fuel pool, or
15 would more than one such misplacement or a
16 misplacement coupled with some other error
17 be needed to cause such criticality?"

18 On page 20, from the fifth line --
19 well, beginning on the fourth line, the
20 Board states: "Suggests that further
21 inquiry on the validity of any
22 calculations involved is warranted in
23 determining whether the required single
24 failure criterion is met."

25 Is that what it states?

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A. It does.

Q. What do you believe the Board means by the required single failure criterion?

A. It -- I -- I repeat that this touches on matter of law beyond my competence.

However --

Q. Okay.

A. -- the -- it -- this order could be construed as a statement by the Board that it wishes to be considered only one failure; namely, misplacement of the single fresh fuel assembly. That is the analysis that's been presented by CP&L on accident issues.

Q. Isn't it -- go ahead.

A. And I would argue that a return to the -- to GDC 62 and the interpretations of it that have been made over the years and a careful interpretation of the Draft Reg. Guide would mean that this analysis of a single misplaced fresh assembly is not adequate to bound the universe of potential failures or errors. Whether or

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not the Board will admit that is something that's beyond my competence to address.

Q. Do you mean admit a contention on that issue?

A. Admit argument on that issue.

Q. Okay.

Isn't it true that in Basis 2, which runs from page 19 to page 20, nothing is said, stated in any way, about physical separation of fuel assemblies or solid neutron absorbers in the racks?

A. That's correct.

Q. Assuming for the moment that this is the contention, what do you believe would be required to answer this contention?

A. Assuming hypothetically that the only test one must pass is to show that a single misplacement of a fresh fuel assembly will not cause criticality, then to meet that test, one performs an analysis showing that $k_{\text{effective}}$ is less than 1 for this hypothesized event. And CP&L has indeed obtained analysis for that event from

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Holtec.

Q. So the analysis that CPL [sic] had done addresses this, if one assumes this is the contention?

A. Given the hypothesis that I made, yes.

Q. Okay.

I'd like to refer you to an exhibit, once I recall what the exhibit number is, which is Orange County Supplemental Petition to Intervene.

MR. O'NEILL: No. 9.

Q. It's Exhibit 9. Turn to page 11.

A. (Complies).

Q. In the second full paragraph, it states: "In order to protect against a criticality accident, CP&L proposes administrative measures that would limit the combination of burn-up and enrichment of the PWR spent fuel in Pools C and D to an acceptable range."

And then on page 12, it stated: "In order to protect against criticality accidents, GDC 62 is quite clear that any

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3 measures relied upon -- or, relied on must
4 be physical rather than administrative.
5 There is no room in the criterion for
6 flexibility or exception. Thus, the
7 administrative measures proposed by CP&L
8 must be rejected as unlawful under
9 GDC 62."

10 Is that what it states?

11 A. It does.

12 Q. Go to Exhibit 11, please.

13 A. (Complies).

14 Q. It states in the first paragraph --

15 A. What page?

16 Q. Page 96. I apologize.

17 States: "We would submit that
18 that --"

19 Obviously a redundant "that."

20 "-- is really quite distinct from a
21 situation where there is a clear
22 regulatory requirement: Thou shalt not
23 use administrative measures in showing
24 compliance with this general design
25 criterion."

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3 Is that your understanding of GDC 62,
4 Dr. Thompson, it's a clear regulatory
5 requirement: Thou shalt not use
6 administrative measures in showing
7 compliance with this general design
8 criterion?

9 MS. CURRAN: Objection. Are you
10 asking Dr. Thompson to remember the exact
11 language of the general design criteria?

12 DR. HOLLAWAY: No. We will get to
13 that. I'm asking if this is his
14 understanding of the contention.

15 Q. Or put simpler, do you agree with this
16 statement?

17 A. My understanding of GDC 62 is that it
18 envisioned criticality controls,
19 acceptable criticality control, being
20 provided by the kinds of measures that do
21 not involve ongoing human action or the
22 operation of support systems, that the
23 protection is provided by the physical
24 configuration and its geometry, and that
25 that would -- on that interpretation, that

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3 burn-up credit would be prohibited flatly
4 by the wording of GDC 62; and I believe
5 that's what Attorney Curran is driving at
6 in this statement.

7 Q. Okay.

8 DR. HOLLOWAY: Let me ... (examining
9 documents).

10 Ask the court reporter to mark as
11 Exhibit --

12 MR. O'NEILL: Twelve -- thirteen.

13 DR. HOLLOWAY: -- 13 an excerpt from
14 10 CFR, specifically the beginning of
15 Appendix A to Part 50, General Design
16 Criteria, and Criterion 62.

17 (Thereupon, Thompson Exhibit No. 13
18 was marked for identification)

19 Q. It states: "Criterion 62, Prevention of
20 criticality in fuel storage and handling."

21 A. Could you bear with me for a moment,
22 please?

23 Q. Oh; I apologize.

24 A. I have it, yes. Go ahead.

25 Q. "Criterion 62, Prevention of criticality

2
3 in fuel storage and handling. Criticality
4 in the fuel storage and handling system
5 shall be prevented by physical systems or
6 processes, preferably by use of
7 geometrically safe configurations."

8 What do you understand the scope of
9 this criterion to be? What does it
10 address?

11 A. Fuel storage and handling at nuclear power
12 plants. I believe this covers just
13 nuclear power plants. And it would cover
14 fresh and spent fuel at all times when
15 present in the nuclear power plant.

16 Q. And what is your interpretation of "shall
17 be prevented by physical systems or
18 processes"? Isn't it that no
19 administrative measures shall be
20 permitted? Is that correct?

21 A. Yes.

22 Q. Does it say anything about administrative
23 measures?

24 A. It -- it does not.

25 Q. What do you think it means when it says

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"preferably by use of geometrically safe configurations"? What's the word "preferably" mean?

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A. "Preferably" means when possible.

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Q. Would you take it from that that things besides geometrically safe configurations would be allowable under this?

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A. Only if there's no way of achieving this criticality safety otherwise.

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Q. But there would be things other than that that would fit under here, hence the word "preferably"?

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A. I -- I would interpret that the word "preferably" was inserted here to cover contingencies where geometric safety cannot be provided and some other option could be developed.

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And given that interpretation of "preferably," I would argue that the -- it is possible to use a rack configuration, which is geometrically safe and does not require the taking of burn-up credit and that that's -- because that is a possible

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3 alternative and indeed was the option that
4 was used until this decade, I would argue
5 that the word "preferably" requires the
6 prohibition of burn-up credit.

7 Q. The word "preferably" requires the
8 prohibition of burn-up credit; is that
9 your position?

10 A. My interpretation of "preferably" is that
11 you use geometrically safe configurations
12 where this is -- where this can be done
13 and that -- the only circumstances in
14 which a configuration that is not
15 geometrically safe might be permitted by
16 this criterion is when no alternative
17 exists.

18 Q. You talked about the alternatives that one
19 could possibly use earlier today. Which
20 of those criticality control measures
21 would fit within GDC 62, in your opinion?

22 A. The rack spacing and the presence of
23 neutron-absorbing panels between
24 assemblies would both satisfy the
25 geometrically safe configuration component

2
3 of this criterion.

4 Q. And the other two, I take it -- you tell
5 me what those are again.

6 A. Boron -- boron in the water and burn-up
7 credit would not satisfy the requirement
8 for geometry safety.

9 Q. Is your interpretation of this -- do you
10 believe it's clear and unambiguous?

11 A. I believe it is.

12 Q. There's no room for reasonable
13 disagreement on this matter?

14 A. I have stated my interpretation of the
15 language, and I can't answer to
16 interpretation by another person.

17 Q. Do you -- do you believe there are other
18 interpretations that are reasonable, in
19 your opinion?

20 MS. CURRAN: Objection. That
21 question is very vague.

22 DR. HOLLAWAY: Okay.

23 Q. Hypothetically, if one were to argue that
24 physical systems or processes that require
25 some administrative control to implement

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were included under this, would you, in your opinion, state that that's an unreasonable interpretation of this?

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A. Yes. Yes, I would.

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Q. Okay; and what is your basis for that, the text itself?

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A. The text itself, and in application to spent fuel pools in 1999, the fact that there is no necessity to use a non-geometrically safe configuration, there is no necessity to rely upon administrative measures.

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The reliance upon administrative measures is different by cost considerations, that nuclear power facilities do not wish to incur the additional expenditure incurred in creating dry storage and that they intend to maximize the occurrence of spent fuel pools, and that they are weakening the level of the control that I believe is considered in the frame by the GDC 62. So that practical set of considerations and

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the practical language I believe prohibit administrative measures.

Q. In your opinion, is it the cost issue that you believe is what violates this or is it regardless of cost?

A. The fact that there is no physical necessity to take burn-up credit in a spent fuel pool, that the -- there is a licensed form of storage - namely, dry storage - that would allow every licensee to run their reactors and use their fuel pools without relying on burn-up credit, the only possible reason that I can think of why the licensees do not do this is to save money.

Q. Would dry storage costs comply with this criterion as written, in your opinion?

A. I do not know at this point about the role of burn-up credit in cask licensing, and that's a point I need to inform myself about.

Q. What about -- what about this Castor cask you've been talking about? You sounded

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familiar with that one. Would that satisfy this?

A. I repeat. At present I don't know the license provisionships on burn-up credit in any of the dry storage technologies.

I would say that there is a qualitative difference in the potential for criticality incidents in casks in dry storage and the pool storage.

Q. What is that difference?

A. The -- if -- if a dry storage technology is not geometric and safe but relies upon burn-up credit, the criticality accident would occur at a time of loading or unloading of the storage vessel in the cask loading pit of the fuel handling building. That's a delimited set of circumstances where this might occur.

In a pool, there is a longer period and a greater variety of circumstances that might lead -- that could potentially lead to a criticality event.

Q. You talked about a qualitative difference

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between pools and casks with respect to criticality control; is that correct?

A. Correct, with respect to the potential for -- the potential of a criticality accident if both required burn-up credit to be taken for criticality control.

Q. And as I take it, foundation for that thesis is the fact that the fuel sits in the pools all the time?

A. Right.

Q. And in the cask, it's only when it's loaded.

A. Correct.

Q. If spent fuel does not go critical when it's moved, does anything change while it sits there?

A. No.

Q. Can you turn to Exhibit -- Exhibit 12.

A. (Complies).

Q. On page 18 is stated Basis 1. Now assuming again that the Board's decision represents the contention, Basis 1 states: "CP&L's proposed use of credit for burn-up

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3 to prevent criticality in Pools C and D is
4 unlawful because GDC 62 prohibits the use
5 of administrative measures, and the use of
6 credit for burn-up is an administrative
7 measure."

8 It then states: "The litigable issue
9 essentially is a question of law. Does
10 GDC 62 permit an applicant to take credit
11 in criticality calculations for enrichment
12 and burn-up limits in fuel, limits that
13 will ultimately be enforced by
14 administrative controls?"

15 On page 19, Basis 1 ends with the
16 statement: "We will permit such a test
17 here by entertaining legal arguments on
18 whether the use of administrative limits
19 on burn-up and enrichment of fuel stored
20 in Pools C and D properly conforms to the
21 requirements of GDC 62 for the prevention
22 of criticality."

23 My question to you, Dr. Thompson, is,
24 does Basis 1 discuss anywhere use of
25 soluble boron in the pool water?

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MS. CURRAN: Objection. When you say "Basis 1," do you mean Basis 1 as described in the order or --

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DR. HOLLAWAY: I'm sorry. I'll clarify.

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Q. When I say "Basis 1," I'm talking about page 18 to 19 of the Atomic Safety and Licensing Board's order admitting contentions, starting on page 18, a., Basis 1, and continuing down to where it says b., Basis 2 above that. That's what I'm talking about.

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If one takes this to be Basis 1, assuming this is Basis 1, does this in any way discuss soluble boron in the pool of water?

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A. It does not.

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Q. Can you turn to Exhibit 11.

21

A. (Complies).

22

Q. Page 26. In the second paragraph, where it begins, "Miss Curran," your counsel states: "I would also like to point out that the proposal to limit the age of the

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3 fuel to something that is over five years
4 is not in the proposed tech specs for this
5 license amendment."

6 Do you know why it was significant to
7 emphasize inclusion in tech specs here?

8 A. I can't guess as to why Attorney Curran
9 introduced it. She does say that whether
10 or not the five-year limit is in the tech
11 specs doesn't undermine our standing.

12 I would guess that her reason for
13 mentioning tech specs in connection with
14 this five-year cooling period for the
15 discharged fuel is to indicate that the
16 applicant is not giving due seriousness or
17 due attention to the hazards posed by
18 recently discharged fuel placed in the
19 compact racks from the perspective of
20 exothermic accident reactions.

21 Q. And the fact that they're not according it
22 due seriousness is because they have not
23 actually proposed to put it in the tech
24 specs; is that --

25 A. I -- I would guess that Attorney Curran is

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using the absence of this five-year cooling period from the tech specs as simply an illustration of the lack of attention being paid by the applicant.

Q. Okay. And if it had been in the tech specs, that would have shown more attention?

A. If my guess is correct, yes.

Q. Would it to you if something was in the tech specs --

A. That -- the -- yes. The presentation of any provision in the tech specs indicates that it gets more attention than if it isn't.

Q. Okay.

A. But that doesn't necessarily guarantee that that's an adequate way to address a problem.

Q. Dr. Thompson, do you agree with the statement by your counsel yesterday that the NRC's position in this proceeding carries great weight?

A. As a practical matter, I have repeatedly

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seen that the NRC's staff's position carries weight, in the sense that it influences licensing board decisions.

Whether it should is another matter. But as a matter of practice, it does.

Q. So you agree with the statement as a practical matter.

A. As a practical matter, but without accepting that this is -- is legally right or morally right.

Q. Do you personally agree with that?

Regardless of a practical matter, is that your position, that the staff -- that the staff's position is significant?

A. I can't answer that yes or no, because it's significant, as a practical matter, licensing boards do assign the weight to NRC staff positions. Any observer of a licensing proceeding will learn this very quickly.

Q. In this proceeding, this proceeding, Harris, do you have concerns about what the staff is doing in this proceeding?

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3 A. On Contention 2?

4 Q. Yes.

5 A. Yes. I think the request for additional
6 information does not go far enough. I
7 think the NRC staff should have required a
8 broader spectrum of accident analyses,
9 misplacements of more than one assembly.
10 They should have required a boron dilution
11 analysis, and they should have required an
12 assessment of the probability and
13 consequences of an -- a correct accident.

14 And as mentioned earlier, I'd like to
15 see the reg guide, the Draft Reg. Guide,
16 brought up to date and issued as a final
17 reg guide within an explicit prohibition
18 of burn-up credit.

19 Q. Do you believe the staff's lack of putting
20 in the things you desired in the RAI, is
21 that demonstrating their complacency in
22 this proceeding?

23 A. Yes.

24 Q. Ask you to turn to Exhibit -- a new
25 exhibit.

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MS. CURRAN: Are you going to go for
a long time on 1.13?

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DR. HOLLAWAY: Why don't we take a
break right here.

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MS. CURRAN: Okay.

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DR. HOLLAWAY: Good idea.

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We'll go off the record.

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Ten minutes? Ten minutes fine?

11

MS. CURRAN: Ten minutes.

12

(Thereupon, a break was taken at

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2:46 PM, with proceedings

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recommencing at 2:57 PM)

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DR. HOLLAWAY: Go back on the record.

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THE WITNESS: Could I clarify a

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couple points?

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DR. HOLLAWAY: Sure; go ahead.

19

THE WITNESS: Okay.

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Point one, from Exhibit 11, when

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Attorney Curran was mentioning the --

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whether or not the tech specs covered the

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five-year cooling time --

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DR. HOLLAWAY: Just a moment, please

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(examining documents).

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Okay, and what page are you discussing?

THE WITNESS: The statement to which you drew my attention is on page 27 --

DR. HOLLAWAY: Okay.

THE WITNESS: -- where Miss Curran says the five-year cooling period is not in the tech specs.

DR. HOLLAWAY: Okay.

THE WITNESS: This actually traces back to page 22, where there was discussion between Judge Lam and Attorney Carr about old and cold fuel. So Miss Curran was evidently drawing attention to something that the -- in which the Board had exhibited interest through Judge Lam.

Q. Is -- is that based on your personal review or you were told that --

A. That -- that's my interpretation from --

Q. Oh, okay.

A. -- from page 22.

Q. Very good.

2
3 THE WITNESS: And the second point,
4 on GDC 62, which appears in Exhibit 13,
5 the --

6 DR. HOLLOWAY: (Examining documents).

7 You may proceed.

8 THE WITNESS: Okay.

9 Criterion 62 states that criticality
10 shall be prevented by physical systems and
11 processes, preferably by geometrically
12 safe configurations.

13 And I'd point out that the -- both
14 separation and the presentation of solid
15 boron-containing panels can be regarded as
16 physical systems. Of those two options,
17 only one - namely, spacing - is geometric
18 safety -- geometrically safe.

19 So you could argue that there is a
20 hierarchy here, that the framers of GDC 62
21 prefer, if possible, the use of adjustive
22 [sic] spacing alone, but would -- I would
23 accept an interpretation wherein solid
24 boron panels are accepted as physical
25 systems.

2
3 DR. HOLLAWAY: Okay.

4 THE WITNESS: That's another
5 interpretation, if you will, of your word
6 "preferably."

7 That's it.

8 Q. Dr. Thompson, I'd like to explore your
9 statements regarding the universe of
10 events that would be considered under the
11 Double Contingency Principle; and when I
12 use that term, as defined on page 1.13-9
13 of Reg. Guide 1.13.

14 The question I have for you is, you
15 have defined four possible ways, four
16 possible measures, for preventing
17 criticality control in spent fuel pools.
18 Could you outline for me, if those are the
19 four measures, what -- the universe of
20 events that would be considered under this
21 Double Contingency Principle?

22 A. One set of events involves misplacements
23 of more than one out-of-compliance
24 assembly, pursuant to a -- potentially
25 pursuant to a single failure in the

2
3 administrative control.

4 And we'll be elaborating on the
5 various possible scenarios in our brief;
6 but one possibility is that a single
7 failure in the administrative or the
8 management process leads to misplacement
9 of multiple out-of-compliance assemblies,
10 and this multiple misplacement, with --
11 with or without boron dilution, might lead
12 to a criticality.

13 I suppose hypothetically that one
14 could identify a single administrative
15 failure that lead to multiple
16 misplacements, such that criticality
17 occurred with boron dilution with
18 relatively common frequency, within the
19 ordinary variation of boron concentration.
20 Then that would be criticality with a
21 single failure.

22 Suppose that it required boron
23 dilution of an even higher frequency, and
24 you could argue that this is a double
25 failure, but perhaps not of -- as unlikely

2
3 as would be required by the reg guide's
4 statement of the Double Contingency
5 Principle.

6 And you'd have to think about fuel
7 misplacements followed by boron dilution
8 events or preceded by boron dilution
9 events; and you could make a matrix of the
10 possible contingencies, and I expect that
11 we will do that.

12 Q. You've identified, as best I can tell,
13 four -- which isn't surprising, because
14 it's a small number of things -- of
15 potential alternatives. Number one was
16 misplacement of a single assembly. Number
17 two was misplacement of multiple
18 assemblies. Number three was boron
19 dilution, and number four was boron
20 dilution plus misplacement of an assembly.

21 A. That's four. I could think of more than
22 four.

23 Q. When you say multiple assemblies, how many
24 would that be?

25 A. To answer that, I'd like to give a little

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background, if I may.

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I would like to see the NRC have a systematic compilation of experience with fuel misplacement.

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Q. Would you require an entire pool full of misplaced assemblies?

A. That's not credible, because there would not -- well, that would be -- presume the shipment into the plant of a very large quantity of out-of-compliance fuel, comparatively fresh fuel; and I -- I think

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3 I'd be willing to accept that that's a low
4 enough probability as to be not -- not
5 necessary to be considered.

6 So the -- outer limit would be the
7 number of out-of-compliance assemblies
8 that could be present in the fuel handling
9 building in the normal sort of operation.

10 Q. You mentioned hearsay that you were aware
11 of on multiple misplacements?

12 A. Right.

13 Q. Will you tell me about that?

14 A. Just mention of an incident in
15 Browns Ferry, and that's all I know.
16 That's --

17 Q. Who did you hear that from?

18 A. Mr. Lochbaum mentioned it to me, but his
19 recollection wasn't clear. It's something
20 we're going to pursue.

21 What I'd prefer to have is -- is a --
22 a database on fuel handling experience,
23 rather than looking at isolated incidents;
24 and it's not at all clear that anyone in
25 the industry or the NRC has kept such a

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database.

4

Q. So your understanding of this Browns Ferry
5 is just you heard Mr. Lochbaum say --

5

6

A. That's -- that's the extent of it so far.

7

Q. Okay -- that he thought there might have
8 been something; is that --

8

9

A. Yeah.

10

Q. Okay.

11

You have stated earlier that your

12

interpretation of GDC 62 you do not

13

believe is subject to a reasonable

14

different interpretation; is that correct?

15

A. Correct.

16

Q. Has the NRC staff, to your knowledge,

17

approved the use of burn-up and enrichment

18

limits?

19

A. Yes, they have in a number of plants.

20

DR. HOLLAWAY: Ask the court reporter

21

to mark as Exhibit --

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THE COURT REPORTER: Fourteen.

23

DR. HOLLAWAY: -- 14 Proposed

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Revision 2 to Regulatory Guide 1.13, dated

25

December 1981.

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(Thereupon, Thompson Exhibit No. 14 was marked for identification)

Q. Dr. Thompson, are you familiar with this document?

A. Yes, I -- I possess it. I'm familiar with it.

Q. Could you turn to page 1.13-9.

A. (Complies).

Q. In fact, turn back to 1.13-7 first. Let's start there.

A. (Complies).

Q. Paragraph 11 states: "A nuclear criticality safety analysis should be performed in accordance with Appendix A to this guide for each system that involves the handling, transfer, or storage of spent fuel assemblies at LWR spent fuel storage facilities."

Moving to page 9, begins, Appendix A, Nuclear Criticality Safety.

Is it your understanding, Dr. Thompson, that this Appendix A here on page 9 is what's being referred to in

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paragraph 11 on page 7?

A. Yes.

Q. Will you turn to page 1.13-13.

A. (Complies).

Q. Paragraph 4.5 discusses how fuel burn-up determination should be made; is that correct?

A. It does.

Q. Go to the next page, 1.13-14.

A. (Complies).

Q. Section 6 is called Credit for Burn-up in Storage Rack Design; is that correct?

A. Yes.

Q. And is it your understanding that this section is how one implements burn-up and enrichment limits with storage -- spent fuel pool storage racks?

A. Yes.

Q. Dr. Thompson, you've stated and you believe, as I understand it, that your interpretation of GDC 62 is -- is very specific and clear and not subject to other reasonable interpretations. Is that

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correct?

A. Yes.

Q. But this Reg. Guide 1.13, dated December 1981, is a staff -- NRC staff document approving the use of burn-up credit in spent fuel pool storage racks; is that correct?

A. That's correct.

Q. In doing this, in implementing this regulatory guide, do you believe the NRC staff is simply negligent or intentionally breaking the law?

A. I would assume negligence.

Q. Can you tell me your understanding of the purpose of a regulatory guide, Dr. Thompson?

A. My understanding is that these -- these guides are to help licensees abide by the regulations, and if a licensee conforms to the regulatory guide, that the staff will typically recommend the granting of the license in question.

Q. Is it your position that a regulatory

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guide such as this would represent the NRC staff's interpretation of what's required to comply with the regulations?

4

5

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A. That's my understanding of what it's intended for.

7

8

I would mention that this one

9

(indicating) is a draft for comment.

10

Q. It's a draft for comment, you say.

11

A. That's what it says on the front.

12

Q. Are you aware of whether or not this

13

Regulatory Guide, Proposed Revision 2, has ever been implemented or used as the basis to approve any licensee applications?

14

15

16

A. It's been referred to repeatedly, and I assume it is the basis upon which the staff has recommended the granting of license amendments for burn-up credit.

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19

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DR. HOLLOWAY: Ask the court reporter to mark as Exhibit --

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MR. O'NEILL: Fifteen.

23

THE COURT REPORTER: Fifteen.

24

DR. HOLLOWAY: -- 15 a letter from

25

Chandu Patel to Charles Dugger

2
3 regarding -- that's D-U-G-G-E-R --
4 regarding issuance of Amendment No. 144 to
5 facility operating license for Waterford,
6 dated July 10th, 1998; and attached to
7 that -- attached to the letter are the
8 appropriate items that are discussed in
9 the letter, including attachments on the
10 amendment itself, technical
11 specifications, and the NRC staff's safety
12 evaluation.

13 (Thereupon, Thompson Exhibit No. 15
14 was marked for identification)

15 Q. Dr. Thompson, have you seen this document
16 before?

17 A. I have a number of these. I'm not certain
18 if I've seen this one.

19 Q. Do you understand that this is one of the
20 documents cited by the applicant in their
21 response to BCOC's contentions?

22 A. I'll -- I'll accept that that's true.

23 Q. Do you understand that this same document
24 has been produced in discovery to BCOC?

25 A. Yes.

2
3 I would mention that in course of
4 discovery, we obtained a number of
5 documents of this kind, for at least a
6 dozen plants.

7 Q. Okay.

8 Could you turn to the -- the ninth
9 page, a graph showing fuel burn-up on the
10 Y axis and initial fuel enrichment on the
11 X axis, numbered 5-6b.

12 A. Yes; I have it.

13 Q. Is it your understanding, Dr. Thompson,
14 that these are burn-up and enrichment
15 curves used for spent fuel criticality
16 control?

17 A. Correct.

18 Q. Dr. Thompson, could you turn to page 3 of
19 the safety evaluation report, which is six
20 pages after that. Page 3 at the top, to
21 help identify it.

22 A. (Complies). I have it.

23 Q. Section 3 states that: "The concept of
24 burn-up reactivity equivalencing was also
25 used in order to store fuel with nominal

2
3 enrichment up to 5.0 weight percent U-235.
4 This concept is based on the reactivity
5 decrease associated with fuel depletion
6 and has been previously found acceptable
7 by the NRC for use in pressurized water
8 reactor, paren, PWR, fuel storage
9 analysis. A series of reactivity
10 calculations is performed to generate a
11 set of enrichment versus burn-up ordered
12 pairs."

13 Is it your understanding,
14 Dr. Thompson, that this approves the use
15 of burn-up credit in the spent fuel pools
16 for the subject amendment?

17 A. It does.

18 Q. And is this approval consistent with the
19 statements in Regulatory Guide 1.13,
20 Proposed Revision 2, Appendix A?

21 A. I'd argue that Appendix A is internally
22 inconsistent in that paragraph 1.4, which
23 states that criticality must not occur
24 without at least two unlikely,
25 independent, and concurrent failures. I

2
3 submit that that is inconsistent with the
4 later provision in this appendix allowing
5 credit for fuel burn-up.

6 Q. There is the -- oh, go ahead.

7 A. Having -- having stated that, it's -- in
8 this license application for Waterford, as
9 reflected in Exhibit 15, and in other
10 license applications, the staff has relied
11 upon the part of Appendix A which
12 envisions burn-up credit.

13 Q. Okay.

14 The last paragraph of page 3, second
15 sentence, says: "However, it is possible
16 to postulate events, such as the
17 inadvertent misloading of an assembly with
18 a burn-up and enrichment combination
19 outside of the acceptable areas in TS
20 Figures 5.6-1, 5.6-2, or 5.6-3, which
21 could lead to an increase in reactivity.
22 However, for such events, credit may be
23 taken for the presence of at least 1720
24 parts per million, paren, ppm, of soluble
25 boron required in the pool whenever a fuel

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3 assembly is moved, since the staff does
4 not require the assumption of two
5 unlikely, independent, concurrent events
6 to ensure protection against a criticality
7 analysis -- criticality accident --
8 sorry -- paren, Double Contingency
9 Principle."

10 Dr. Thompson, aren't the analyses
11 done here and approved by the staff here
12 similar to and consistent with the
13 analyses the applicant has had done in
14 this proceeding?

15 A. Yes, they are similar.

16 I would point out that earlier today,
17 I mentioned that the Double Contingency
18 Principle has been interpreted in a manner
19 that I believe is inconsistent with
20 Appendix 1. -- with paragraph 1.4 of
21 Appendix A of Exhibit 14; and this
22 Waterford SAR at page 3 is an illustration
23 of that misinterpretation.

24 Q. So this is an example of the
25 misinterpretation you've been talking

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3

about.

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A. Yes.

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Q. Is this another example of staff
6 lawlessness?

6

7

A. Negligence.

8

Q. Fair enough.

9

DR. HOLLOWAY: Ask the court reporter
10 to mark as Exhibit 16 a letter from
11 Timothy Polich to Lance Terry, subject,
12 Comanche Peak Steam Electric Station,
13 Amendment Nos. 46 and 32, dated
14 February 9th, 1996.

15

(Therefore, Thompson Exhibit No. 16
16 was marked for identification)

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DR. HOLLOWAY: And again, I'll note
18 attached to that letter is the safety
19 evaluation performed by the staff.

19

20

Q. Dr. Thompson, if you could turn to
21 page 3 --

21

22

A. (Complies).

23

24

Q. -- at the bottom of that page, there's a
24 discussion of the concept of burn-up
25 reactivity equivalencing that was used.

25

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3 And on page 4, in the second full
4 paragraph, a discussion again of the
5 so-called Double Contingency Principle as
6 defined by the staff in this document.

7 Is this the same -- does this reflect
8 the same interpretations as the last
9 license amendment approval that we
10 discussed, which was Exhibit 15?

11 A. It does.

12 Q. So the negligence the staff's exhibiting
13 is not isolated to a single circumstance;
14 do you agree with that?

15 A. It's been repeated in many licensing
16 actions.

17 Q. Okay.

18 DR. HOLLOWAY: I'd ask the court
19 reporter to mark as Exhibit 17 a letter
20 from James Stone to Steven Miltenberger,
21 subject, spent fuel pool reracking, Salem
22 Nuclear Generating Station, Units 1 and 2,
23 dated May 4th, 1994.

24 (Thereupon, Thompson Exhibit No. 17
25 was marked for identification)

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Q. Dr. Thompson --

DR. HOLLAWAY: Oh; again, this has the safety evaluation by the staff attached to the letter.

Q. Dr. Thompson, could you turn to page 6, please.

A. (Complies). I have it.

Q. This discusses again reactivity equivalencing. And page 7 discusses the analysis of the Double Contingency Principle again, using the same wording, "The staff does not require the assumption of two unlikely, independent, concurrent events to ensure protection against a criticality accident."

Is this the same logic by the staff as the last two exhibits, the last two license amendment exhibits, 15, 16?

A. Yes.

Q. Okay. And you agree that there are several other NRC staff license amendment approvals doing the same thing.

A. Yes.

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3 Q. Okay. I don't need to introduce any more.

4 Okay.

5 (Thereupon, a discussion was held off
6 the record)

7 DR. HOLLAWAY: I ask the court
8 reporter to mark as Exhibit --

9 THE COURT REPORTER: Eighteen.

10 DR. HOLLAWAY: -- 18 a document
11 entitled Licensing Report for Expanding
12 Storage Capacity in Harris Spent Fuel
13 Pools C and D. It has no date on the
14 front. The second page shows Revision 3,
15 dated 2/18/99.

16 MS. CURRAN: Can I ask you for a
17 point of clarification here, just because
18 I want to be careful?

19 DR. HOLLAWAY: Sure.

20 MS. CURRAN: This box (indicating),
21 on the bottom, says "Company, private";
22 but I don't see the company standard
23 stamp, and I'm not sure how I should take
24 care of this document.

25 DR. HOLLAWAY: Good point. It should

2
3 say -- every page shall be marked
4 "Proprietary" in here, but every page -- I
5 think we agreed every page will be marked
6 "Confidential, proprietary," I don't
7 know.

8 MS. CURRAN: I'll treat it that way.
9 I just want to make sure, you know, I
10 don't leave it on the kitchen table or
11 something.

12 DR. HOLLAWAY: Good. I very much
13 appreciate your pointing that out. That's
14 a big help.

15 DR. HOLLAWAY: I'll tell you what
16 we'll do, Diane --

17 MS. CURRAN: Yeah.

18 DR. HOLLAWAY: -- if you're concerned
19 about it.

20 MS. CURRAN: Yeah.

21 DR. HOLLAWAY: Since this one
22 (indicating), for whatever reason,
23 isn't --

24 MS. UTTAL: Bill, this (indicating)
25 has got the proprietary stuff blacked out.

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MS. CURRAN: I can read it.

DR. HOLLAWAY: It's actually not
blacked out.

MS. UTTAL: Oh.

DR. HOLLAWAY: This is the one that's
great with printing.

MS. CURRAN: It's highlighted.

DR. HOLLAWAY: It's highlighted, make
sure you can't miss it.

MR. O'NEILL: Oh; that's even better.

DR. HOLLAWAY: Let's go off the
record for a moment.

(Thereupon, a discussion was held off
the record)

(Thereupon, Thompson Exhibit No. 18
was marked for identification)

DR. HOLLAWAY: Back on the record.

Given that the document we have in
front of us is not stamped with the
additional proprietary stamp, we will not
introduce this as an exhibit for purposes
of the record. The document is the
Licensing Report for Expanding Storage

2
3 Capacity at Harris Spent Fuel Pools C and
4 D. This document has been provided -- in
5 fact, was provided to BCOC before our
6 contentions have been filed, and has since
7 been produced to both BCOC and the staff
8 subsequent to discovery in this
9 proceeding.

10 The section I have provided here for
11 you to look at is Chapter 4, which is the
12 chapter on criticality safety evaluation.

13 MS. CURRAN: Just one more point of
14 clarification; and you may have said this
15 already, but there's -- there's no date on
16 the front.

17 DR. HOLLOWAY: Yes.

18 MS. CURRAN: The last date on the --
19 the bottom of the second page seems to be
20 May 26th, '98.

21 THE WITNESS: (Indicating).

22 MS. CURRAN: Oh, no; I'm sorry --
23 February 18th, '99, just so we know which
24 copy -- which version we're talking about.

25 DR. HOLLOWAY: I actually stated that

2
3 earlier for the record; but it's
4 Revision 3, with the date of 2/18/99.

5 MS. CURRAN: Oh, okay. All right.

6 DR. HOLLAWAY: So there's no
7 ambiguity, make sure you've got the right
8 one.

9 Q. Dr. Thompson, have you seen --

10 A. I don't have mine yet.

11 Q. Oh. Good point.

12 A. (Examining document).

13 Q. Dr. Thompson, have you seen this report
14 before?

15 A. Yes.

16 Q. Specifically, have you seen Chapter 4 of
17 this report?

18 A. Yes.

19 Q. We have talked about this earlier, that an
20 area that you are not competent in is
21 determining whether, assuming the
22 assumptions are valid, the calculation
23 itself was done correctly.

24 I'd like to ask you, do you have any
25 objections or concerns with the analysis

2
3 itself, setting aside the assumptions and
4 whether or not it has been done correctly?

5 A. I have no intention of reproofing or
6 reviewing this calculation. And whether
7 the County, as a matter of law, is willing
8 to accept and stipulate that it's accurate
9 is something I can't speak to.

10 Speaking strictly personally, I think
11 it's likely that the calculations are
12 accurate.

13 Q. You -- you don't know of any inaccuracies,
14 nor do you expect to challenge the
15 accuracy yourself.

16 A. Correct, correct.

17 Q. Okay.

18 In this particular analysis, do you
19 understand that this particular analysis
20 does not include a misplacement event?

21 A. That's right. That was done later in
22 response to a request for additional
23 information.

24 Q. Are there any assumptions in this
25 analysis -- setting aside the

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misplacement, which we acknowledge is not
done here, are there any assumptions in
here that you take issue with?

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A. None that I've identified. It's -- it's a
very carefully written, very presentable
document that's in a high professional
competence.

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Q. Okay.

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A. Within the assumptions provided to the
analysts.

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DR. HOLLOWAY: We can collect that
(indicating) up. We'll move to one that
is stamped.

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THE WITNESS: (Handing document).

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(Thereupon, the exhibit previously
marked as Thompson Exhibit No. 18 was
not attached to the record, per
counsel instructions)

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THE WITNESS: Just for clarification,

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Dr. Hollaway --

23

DR. HOLLOWAY: Yes.

24

THE WITNESS: -- the -- in accepting

25

the merit of these calculations, I'm

2
3 not -- my understanding is that I'm not
4 accepting that the assumptions are
5 adequate.

6 DR. HOLLOWAY: I understand that.

7 Q. With respect to that particular
8 calculation that we understand does not
9 address misplacement, so that's off the
10 table, and setting aside your concerns
11 about the use of burn-up and enrichment
12 limits, so assuming that was lawful, do
13 you have any other concerns about the
14 assumptions in this?

15 A. The -- my recollection is that it -- it
16 did consider an absence of boron; and
17 assuming that -- considering the
18 criticality analysis and the absence of
19 soluble boron, assuming that my assumption
20 is correct and that we're not dealing with
21 accidents in this analysis, then I'm
22 comfortable with the assumptions.

23 Q. Okay.

24 DR. HOLLOWAY: Ask the court reporter
25 to mark as Exhibit --

2
3 THE COURT REPORTER: Eighteen.

4 MR. O'NEILL: Eighteen.

5 DR. HOLLOWAY: -- Exhibit 18 a letter
6 from Donna Alexander to the NRC on
7 supplemental information regarding the
8 license amendment request, dated
9 October 15th, 1999.

10 (Thereupon, Thompson Exhibit No. 18
11 was marked for identification)

12 Q. Dr. Thompson, have you seen this --

13 A. Yes, I have.

14 Q. -- before? At the bottom of the first
15 page of the letter, it says that the
16 vendor, Holtec, has performed additional
17 misloading analyses and these analyses
18 demonstrate criticality will not occur as
19 a result of the misloading of the fresh
20 fuel assembly in the spent fuel storage
21 racks for HNP Pools C and D.

22 Dr. Thompson, does this letter and
23 the results contained in it address your
24 concerns for Basis 2 of Contention 2?

25 A. Address the concerns. It's -- it's

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certainly relevant to the concerns in
Contention 2.

Q. Does it address any of your concerns as
included in Basis 2 of Contention 2?

A. It's not relevant to the County's
contentions about the lawfulness of boron
credit.

Q. I'm speaking about Basis 2, not Basis 1;
so ...

A. Right, right.

Q. -- so with that assumption.

A. This calculation establishes a -- that
given a single misloaded fresh assembly,
that K_{∞} is less than 1 without
credit facility for boron.

Q. Okay.

A. That's a good result. It does not exhaust
the universe of errors and misplacements
and accidents that I've previously
discussed, which could include multiple
misplacements.

Q. Go to Exhibit 12. It's the Board's order,
admitted contentions.

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A. (Complies).

Q. Do you have it?

A. I do.

Q. Page 19 to page 20.

Assuming that this is in fact Basis 2 of Contention 2, the statement in the Board order here, does the letter you just wrote satisfactorily address what is stated here, assuming this is Basis 2, specifically where it says, Will a single fuel assembly misplacement, involving a fuel element of the wrong burn-up or enrichment, cause criticality in the fuel pool? Does it address that satisfactorily?

A. It does address the question of a single fuel assembly misplacement. And this finding, this Holtec finding mentioned in Exhibit 18, does show that critical- -- that a single misplacement still allows criticality safety without boron. Whether that satisfied our contention is a matter of law, I'd argue.

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Q. Okay. So in fact the analysis that was done that, as you have pointed out, does not take credit for soluble boron goes farther than the words stated in that Board order, if one assumes those are the right words.

A. The -- just bear with me one moment (examining document).

Q. Sure; go ahead.

A. I -- I can't prejudge how the licensing board is going to see this -- this information that I've just mentioned about, criticality safety being assured without boron and with a single misplacement; and there -- there are apparent assumptions in the -- the Board's order that I think is subject to interpretation and legal argument, and I really don't feel competent to get into that.

Q. Can you just identify the assumptions that you think might be subject to interpretation?

2
3 A. For example, on page 19 of the Board
4 order, Exhibit 12 --

5 Q. Yes.

6 A. -- will a single fuel assembly
7 misplacement, et cetera, cause
8 criticality, or would more than one such
9 misplacement or misplacement coupled with
10 some error -- other error be needed, I
11 think that statement excludes -- wrongly
12 excludes the possibility of a single
13 failure leading to multiple misplacements.

14 Q. Okay.

15 A. But the extent to which the intervenor can
16 challenge the Board on this sort of
17 interpretation is beyond my competence.
18 It's a -- it's a legal matter.

19 I -- I -- I believe the Board has --
20 has not covered the universe of -- of
21 errors and failures that it should have
22 done.

23 Q. Any other assumptions in the Board's order
24 that goes from 19 to 20 that you think
25 might be subject to interpretation? I

2
3 know you've just discussed one. I just
4 want to make sure there aren't others that
5 haven't been identified.

6 A. Since Holtec has established that a single
7 misplacement is safe without boron, then
8 the remaining universe of failures all
9 involves misplacement of more than one
10 assembly.

11 Q. Okay.

12 DR. HOLLAWAY: We can go off the
13 record here when we ...

14 Let's go back on the record.

15 Q. Dr. Thompson, I'm going to discuss a
16 document entitled Evaluation of Fresh Fuel
17 Assembly Misload in Harris Pools C and D,
18 dated -- on page 3, revision number;
19 original signed in the approved and date
20 column 9/20/99.

21 I will point out this is a copy of
22 the exact document that I provided to
23 Miss Curran last Thursday and Miss Uttal
24 as stamped here and that we've been
25 discussing this document earlier, and

2
3 also, that it is in fact the document that
4 is referred to in the letter that we have
5 just discussed, which was Exhibit No. 18.

6 Have you had had an opportunity to
7 look at that document?

8 A. No.

9 Q. You have not?

10 Q. All right, you will have your opportunity.

11 DR. HOLLAWAY: Ask the court reporter
12 to mark as Exhibit --

13 THE COURT REPORTER: Nineteen.

14 DR. HOLLAWAY: -- 19 the
15 aforementioned document entitled
16 Evaluation of Fresh Fuel Assembly Misload
17 in Harris Pools C and D. It has on the
18 third page, as I just stated, revision;
19 original, in the approved and date column,
20 has the date 9/20/99.

21 (Thereupon, Thompson Exhibit No. 19
22 was marked for identification)

23 DR. HOLLAWAY: Once again, to repeat
24 what I just stated a minute ago, this
25 document I provided to Miss Curran and

2
3 Miss Uttal last Thursday. It is stamped
4 confidential, and it is the evaluation
5 that's discussed in the letter.

6 Q. I'm going to ask you, Dr. Thompson,
7 regarding whether or not you will take
8 issue with or challenge the validity of
9 the analyses done here, assuming the
10 assumptions are valid. So setting aside
11 the assumptions, will you be challenging
12 the validity of the calculation itself?

13 A. No.

14 Q. Okay. Have you read this document?

15 A. I have actually seen this in the last few
16 days and haven't studied it in detail, but
17 I understand that it gives the background
18 to the two misplacement calculations that
19 were performed and the results of which
20 were summarized in the letter we just
21 mentioned.

22 Q. The self same letter that was Exhibit 18;
23 is that correct?

24 A. Right.

25 Q. Okay. I'm going to ask you whether you

1
2
3 take issue with any of the assumptions
4 here that go into this analysis.

5 And if you require time to look at it
6 again before you're willing to answer
7 that, the text is six pages, and I would
8 certainly be willing to wait for you to
9 look at it.

10 A. I -- "take issue"; could you explain what
11 that means?

12 Q. Are there any assumptions in this analysis
13 that you disagree with?

14 A. The assumptions employed in this analysis
15 do not exhaust the universe of failures
16 that should be determined in the
17 criticality safety analysis.

18 Q. Which you and I have discussed several
19 times today.

20 A. Several times, yes.

21 Q. Setting aside the fact -- well, first of
22 all, that universal misplacement -- or,
23 universe of --

24 A. -- failures.

25 Q. -- failures that we've been discussing,

2
3 you just stated that because this analysis
4 considered soluble boron -- without
5 soluble boron and a misplacement, that the
6 remaining universe would be multiple
7 misplacements; is that right?

8 A. Correct.

9 Q. So setting aside the fact that this does
10 not assume multiple misplacements.

11 A. For the part of the universe that deals
12 with single misplacements, this set of
13 assumptions I will accept as adequate for
14 a criticality safety analysis.

15 Q. Okay. Can I also say that with the
16 exception of assumption of multiple
17 misplacements, the assumptions that are in
18 here are valid for a criticality
19 analysis --

20 A. Yes.

21 Q. -- to meet Reg. Guide 1.13, with the
22 exception of the multiple misplacements?

23 A. Yes, yes.

24 Q. Okay. All right.

25 Dr. Thompson, yesterday you went on a

2

3

tour of the Harris facility, and
specifically the fuel handling building;
is that correct?

4

5

6

A. Yes.

7

Q. Did you see anything while you were on
that tour that you thought was unsafe or
that you were concerned about in any way?

8

9

10

A. Yes.

11

Q. And what was that?

12

A. On repeated occasions, the security doors
did not close naturally and had to be
closed by a personnel. That was true on
roughly a third of the doors we went
through.

13

14

15

16

17

Q. Was there anything else you thought was
unsafe or that you were concerned about in
any way that you saw on your tour?

18

19

20

A. Unsafe in the routine operational sense?

21

Q. In any way, as you choose to define
"unsafe."

22

23

A. The -- I've -- I have concerns about this
license amendment in regard to severe
accident potential and criticality. My

24

25

2
3 visit to the fuel handling building
4 generally confirmed my -- the
5 understanding I had reached from the FSAR
6 and did not alter my conclusions regarding
7 severe accident potential and criticality.

8 Q. Okay.

9 A. Aside from those issues, at this -- and
10 the only evidence that I saw of lack of
11 operational safety was the security doors.

12 Q. The security doors, tell me again what
13 happened.

14 A. Those doors didn't close automatically as
15 people went through, they had to be
16 manually closed.

17 Q. And that was unsafe, in your opinion?

18 A. I think that's a poor practice for a
19 security system.

20 Q. Unsafe?

21 A. Security is an aspect of plant safety,
22 yes.

23 Q. So your answer is yes.

24 A. Yes.

25 Q. Okay. When the security doors did not

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close automatically within ten seconds,
what happened?

A. In each case they were pulled closed by
one of the CP&L employees present.

Q. Did any security force members arrive on
the scene or did you see anyone?

A. No, but that's not necessary to have a
safety violation.

MS. CURRAN: Mr. Thompson's lawyer
wants to testify about a very unnerving
experience with respect --

MS. UTTAL: A man with a machine --

MS. CURRAN: A man with a machine gun
that showed up when the door was open too
long.

Q. Did you see any large gun while you were
there?

A. Oh, yes.

Q. Okay.

A. No, I don't think you should trivialize
this point. I think it's an example of
poor housekeeping, and I hope it's
corrected.

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Q. Dr. Thompson, are you -- are you going to be developing an affidavit for this proceeding on Contention 2?

A. I -- I will certainly be contributing to the filing from Orange County, and I don't know what form that will take.

Q. Okay. Do you know what an affidavit is?

A. Yes.

Q. If you were asked to sign an affidavit in this proceeding, hypothetically, would you read it before you signed it?

A. Yes.

Q. Have -- has any affidavit been completed for your signature to date in this proceeding?

A. Not that I'm aware of.

Q. Are you --

A. But -- I mean, this proceeding, going back to January.

Q. Yes.

A. Any affidavit that I've signed I have prepared and -- and reviewed carefully.

Q. Specifically, affidavits for the

2

3

subpart (K) filing coming up later this
4 year, you have not completed or been
5 provided with a completed affidavit yet;
6 is that correct?

7

A. That's correct.

8

Q. Have you been provided with a draft
9 affidavit yet?

10

A. No.

11

Q. Have you been provided with an outline of
12 an affidavit?

13

A. No.

14

Q. Do you have any idea when, if ever, you
15 would have a final affidavit?

16

A. Attorney Curran and I have discussed in
17 very general terms what this filing will
18 consist of, but we haven't discussed an
19 affidavit specifically.

20

Q. Okay.

21

A. It --

22

DR. HOLLAWAY: I'd like to take a

23

brief break before we wrap up; say, ten
24 minutes?

25

MS. CURRAN: Okay. How long do you

2
3 think wrap-up is likely to take?

4 DR. HOLLAWAY: Not long I do -- don't
5 believe.

6 MS. CURRAN: Great.

7 DR. HOLLAWAY: That remaining box --
8 Off the record.

9 (Thereupon, a discussion was held off
10 the record; and a break was taken at
11 4:01 PM, and proceedings recommencing
12 at 4:09 PM)

13 DR. HOLLAWAY: First I would like to
14 take back Exhibit 19. Both part- -- in
15 fact, all parties have a copy of this
16 document already; and it's thoroughly
17 identified in the record to make it
18 unambiguous. Any concerns?

19 MS. UTTAL: No.

20 DR. HOLLAWAY: And my purpose for
21 doing so is then the transcript will have
22 nothing confidential in it and we don't
23 have to worry about it being marked
24 confidential.

25 You don't have to keep it

2
3 confidential, which should be a big help
4 to everyone.

5 (Thereupon, the exhibit previously
6 marked as Thompson Exhibit No. 19 was
7 not attached to the record, per
8 instruction of counsel)

9 Q. Dr. Thompson, do you have a personal
10 interest in this issue of criticality
11 control for fission reactor spent fuel
12 pools?

13 A. No.

14 Q. Have you ever filed comments on the
15 proposed Regulatory Guide 1.13, Proposed
16 Revision 2?

17 A. No.

18 Q. Ever filed comments on any other proposed
19 rule-making regarding fission reactor
20 criticality control?

21 A. No.

22 Q. Have you ever filed any 10 CFR 2.206
23 petitions regarding fission reactor
24 criticality control?

25 A. No.

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Q. Have you ever filed any comments whatsoever on the staff regarding fission reactor criticality control where you weren't being paid to do so?

A. No.

Q. Dr. Thompson, you stated that your knowledge regarding the issue of fission reactor criticality control is still developing; is that correct?

A. Yes.

Q. Are you being paid by BCOC to develop that knowledge?

A. No. It comes up incidentally as a product of participation in this proceeding.

Q. Are you being paid to be here today by BCOC?

A. Yes, I am.

Q. Do you have any budget limitations between now and the beginning of January on your participation in this proceeding?

A. At the beginning of January to now?

Q. Yes, sir.

A. Not explicitly. The County is anxious to

2
3 keep its costs as low as possible.

4 Q. So your budget, as you understand it,
5 would be unlimited, except you'll attempt
6 to keep it down?

7 A. I think "we," meaning Attorney Curran and
8 myself, have given the County an outer
9 limit a few months ago as to what we
10 expected the budget to be, different
11 phases. I don't remember any details of
12 that.

13 Q. Any estimate on what that outer limit was?

14 A. No. It was certainly under two hundred
15 thousand dollars, but --

16 Q. Would that be for both yourself and
17 Miss Curran?

18 A. Right.

19 Q. What percentage of that, approximately,
20 would be yourself, fifty percent?

21 A. I would be a bit less than fifty percent.

22 Q. Forty percent, approximately?

23 A. Maybe, yeah.

24 Q. Okay.

25 Dr. Thompson, did you answer every

2
3 question I asked here today truthfully, to
4 the best of your knowledge?

5 A. I did.

6 Q. Would you like to change any of your
7 answers at this time?

8 A. No.

9 DR. HOLLOWAY: I have no further
10 questions for Dr. Thompson at this time.

11 MS. UTTAL: I have no questions.

12 MS. CURRAN: No questions.

13 THE WITNESS: Okay.

14 MR. O'NEILL: Thank you.

15 DR. HOLLOWAY: The deposition of
16 Dr. Thompson is concluded. We'll go off
17 the record.

18 (Thereupon, a discussion was held off
19 the record)

20 DR. HOLLOWAY: We want it ordered.
21 No mini, just askii and hard. Please put
22 the askii in Word, if you can.

23 MS. CURRAN: I just want the hard
24 copy. I'll take an askii if there is no
25 extra charge.

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MS. UTTAL: I'd like the hard copy.
(THEREUPON, THE WITNESS WAS DISMISSED
AT 4:14 PM)

(READING AND SIGNING RESERVED)

2

3

C E R T I F I C A T E

4

STATE OF NORTH CAROLINA
COUNTY OF JOHNSTON

5

6

I, MELODY L. RIFE, Registered

7

Professional Reporter and Notary Public, do

8

hereby certify that the deposition of

9

GORDON THOMPSON, PH.D., was taken and

10

transcribed by me; and that the foregoing two

11

hundred and seven (207) pages constitute a true

12

and accurate transcript of the testimony of the

13

witness.

14

I do further certify that I am not of

15

counsel for, or in the employment of either of

16

the parties to this action, nor am I interested

17

in the results of this action.

18

IN WITNESS WHEREOF, I have hereunto

19

subscribed my name this 24th day of October

20

1999.

21

22

Melody L. Rife

MELODY L. RIFE, RPR

23

Notary Public,

24

State of North Carolina

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My Commission Expires: 5/23/04



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WITNESS CERTIFICATION

I, GORDON THOMPSON, PH.D., do hereby
certify:

That I have read and examined the
contents of the foregoing two hundred and seven
(207) pages of record of testimony as given by
me at the time and place herein aforementioned;

And that to the best of my knowledge
and belief, the foregoing two hundred and seven
(207) pages are a complete and accurate record
of all of the testimony given by me at said time,
except as to where noted on the attached errata
addendum.

* * * * *

Sworn to and subscribed before me on
the _____ day of _____ 1999

Notary Public

My Commission Expires: _____

RECEIVED
DEC 03 1999

GORDON THOMPSON, PH.D.

PAGE 209

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and belief, the foregoing two hundred and seven
(207) pages are a complete and accurate record
of all of the testimony given by me at said time,
except as to where noted on the attached errata
addendum.

G.R. Thompson 11/30/99

* * * * *

Sworn to and subscribed before me on
the _____ day of _____ 1999

Notary Public

My Commission Expires: _____

C O R R E C T I O N S

JOB #: MR4323X
 TYPE: MR
 PROOF: MR
 VOL. #:
 DATE TAKEN: 10-21-99

Gordon Thompson, THE WITNESS HEREIN, SUGGESTS
 THAT THE FOLLOWING CHANGES BE MADE IN THE TRANSCRIPT OF
 HIS/HER DEPOSITION IN ORDER TO MORE ACCURATELY REFLECT
 HIS/HER INTENDED TESTIMONY:

PAGE	LINE	READS	SHOULD READ
12	14	for a document	or a document
16	18	phase, two technical	phase with two technical
18	14-15	consultants, Institutes or employees'	consultants. The Institutes employs consultants
		consultants, from	from
23	12	Codes that are	Codes are
23	14	Correspondence, response for the request	Correspondence, the response to the request
24	11	on the line	underlying the
34	6	Main	Maine
34	15	1 - - - 1980.	I think perhaps 1980
34	18	Main	Maine
34	19	PW	PWR

C O R R E C T I O N S

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PAGE	LINE	READS	SHOULD READ
35	7	for PWR	four PWR
35	19	investor, Vienna	University of Vienna
35	23	is a neighboring	is in a neighboring
36	5	In about an	About an
36	13	The contribution	A contribution
39	23	of United	of the United
41	7	understanding,	understanding is
42	16-17	can sort of guard	Can regard as
		as low-density,	low-density, in
		open	an open
43	19	facility at which	facility which
47	7	limit the	limiting the

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PAGE	LINE	READS	SHOULD READ
47	22	is very important	is a very important
		to a regulatory	regulatory
48	25	criticality instant	criticality incident
49	3	making two	moving two
53	7	taking credit	taking of credit
54	10	burn-up enrichment	burn-up and
		and enrichment	enrichment
54	15	machinery or the	machinery or the
			provision of
60	10	and now brief	in our brief
60	21	than were on	than are born
62	13	cycle a fission	cycle of fission
62	14	born and causes	born until it causes

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PAGE	LINE	READS	SHOULD READ
62	15-16	that -- because	that is of
		it's of interest	interest
62	23	the primer that	the parameter that
63	10	may -- is -- is	may approach
63	16-17	they tend to be	the reaction
		self -- tend to be	tends to be
		-- tend to be	
63	19	analyses of this	analyses within ^{this} which
64	22	in that finite	in a finite
64	23	neurons	neutrons
65	7	fission	fissile
66	15	fission	fissions
66	21	uranium	linear

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PAGE	LINE	READS	SHOULD READ
69	18-19	viewgraphs are drawn in NRC	viewgraphs drawn on NRC
71	12	the case	this case
71	16	the safety	their safety
74	12	here. In	here in
74	13	regard -- Contention	regard to Contention
74	14	at this point would be on my	of this point are beyond my
75	14	by a Commission	by the Commission
75	16	meets	meet
76	25	improved	approved
77	3-4	it goes to the design -- it can be --	

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PAGE	LINE	READS	SHOULD READ
77	7	and that	and there
77	9-10	requirement at -- in terms of site- specific requirement,	requirement in terms. of site-specific requirements and
77	21	cases	Casks
88	8	by -- in	in
88	9	case,	case, a
88	14	You turn	If you turn
88	15	attachment,	attachment
89	11	pocket	onset
89	14	The analysis -- numerous	Numerous
89	21	at least be limited to that -- all	be limited to much less than that in all

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PAGE	LINE	READS	SHOULD READ
90	11	fueling	filling
91	14	clouding	cladding
91	16	steam is occurring	steam - zirconium or
		or if occurring	air-zirconium reaction
96	7	shared	showed
100	14	potential for	potential for a
105	11	initiate	initiated
105	15	Tandy	Sandia
125	16	frames had, the	frames had for the
125	21	serious that you	seriously you
125	22	as my	of my
126	23	one side there's	the other side is
131	7	assume that	assume as

C O R R E C T I O N S

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PAGE	LINE	READS	SHOULD READ
131	8	done -- in	done in
131	18	for -- in C	for pools C
134	20	couple	couple of
134	21-22	Contention on a	Contention and a
134	23	using its words	using words
148	16	different	driven
148	17-18	power facilities	power licensees
148	19	incurred in	of
148	21	occurrence	occupancy
148	23	the control	Criticality control
148	24	frame by the	framing of
150	14	geometric and	geometrically
156	19	assign the	assign